THE IMPACT OF THE CANTERBURY, NEW ZEALAND, EARTHQUAKES ON COUPLES' RELATIONSHIP QUALITY: A DYADIC AND LONGITUDINAL INVESTIGATION

A thesis submitted in partial fulfilment of the

requirements for the Degree

Doctor of Philosophy in Psychology

by Emma M. Marshall

Department of Psychology, University of Canterbury

2015

Table of Contents

List of Tables

List of Figures

Acknowledgements

Associate Professor Roeline Kuijer (my primary supervisor), I cannot convey how grateful I am for all you have done for me. Thank you for guiding me over the years. You have taught me ***so much*** and I just love working with you! We often joke about how I have morphed into a 'mini Roeline'. However, I seriously hope that I have to some extent as you are an incredible researcher and person to emulate.

Professor Jeffry Simpson (my secondary supervisor) your passion for social psychology (and close relationship science more specifically) is infectious and your knowledge about it is staggering. After each meeting I have with you I feel inspired and excited about research. Thank you for your generosity and support. I really cannot thank you enough but I hope this is a "good start".

Thank you, Professor Neville Blampied (my secondary supervisor) for your feedback on my dissertation. To Associate Professor Nickola Overall and Dr. Ohad Szpsenwol, thank you both so much for your feedback and guidance in the results section of this project. I also want to acknowledge Fulbright New Zealand who provided me with the incredible opportunity to attend the University of Minnesota for 11 months.

To the University of Canterbury crew and University of Minnesota crew, thank you for the adventures. Thank you Alana, Argene, Allie, and Jess, in particular for all your dissertation-related encouragement, I do not know what I would do without each of you in my life! To my other amazing friends outside of my University life (in particular the Tight 5) thanks you for walking through life with me.

Thank you to my crazy family for filling my life with joy and always being there for me. Mum and Dad, thank you for supporting me no matter what and reminding me that I can do anything I set my heart and mind to. To the Marshall family, thank you for your support over the years.

Tim Marshall, I could not have a better best friend and husband than you. You have sacrificed so much for me to achieve my goals. To name just a few, you have supported me financially, spent your weekends delivering flyers to recruit for this study, and moved half way across the world without question when I said that it would benefit my career. Thank you for standing by me and supporting me through thick and thin.

Finally, I want to thank all the couples who participated in my study as you made this project possible. I was humbled by how many of you participated in this study because you wanted to "help others that might experience a natural disaster". I hope this research does just that.

I dedicate this dissertation to all those who experienced loss (loss of a family home, loss of a loved one, and so on) from the earthquakes and their aftermath.

Abstract

Canterbury, New Zealand, was struck by two major earthquakes in 2010 and 2011. Using a dyadic and developmental perspective, the current thesis first aimed to determine how the experience of earthquake-related stressors (including loss of material resources, trauma exposure, and ongoing earthquake-related stressors) and stress (posttraumatic stress symptoms) impacted individuals' intimate relationship quality (Part 1). Data were collected from a sample of 99 couples at four time points over a period of approximately 15 months, with Time 1 completed 14 months after the 2010 earthquake (eight months post the 2011 earthquake). Data were analysed using moderated growth curve modelling in an Actor-Partner Interdependence Model framework. In line with expectations, posttraumatic stress symptoms were the strongest predictors of relationship quality. More specifically, individuals' (actor) posttraumatic stress symptoms and their partner's posttraumatic stress symptoms had an adverse effect on their relationship quality at Time 1. Demonstrating the importance of taking a developmental perspective, the effect of partner posttraumatic stress symptoms changed over time. Although higher partner posttraumatic stress symptoms were associated with worse relationship quality in individuals (actors) at Time 1, this was no longer the case at Time 4. Differences were also found between men and women's actor posttraumatic stress symptom slopes across time. Using the same data and analyses, Part 2 built on these findings by investigating the role of a possible posttrauma resource available within the relationship – support exchanges. Overall, results showed that individuals were protected from any adverse effects that posttraumatic stress symptoms had on relationship quality if they had more frequent support exchanges in the relationship, however, differences between men and women and slopes across time were found. Although not the case initially, individuals' relationship quality was worse in the longer-term if their partner reported receiving lower support from them when they were experiencing high posttraumatic stress

symptoms. Results also suggested that although women coped better (as evidenced through slightly better relationship quality) with higher symptoms and lower support than men initially, these efforts diminished over time. Furthermore, men appeared to be less able to cope (i.e., had worse relationship quality) with their partner's stress when they were not receiving frequent support. Contrary to expectations, negative exchanges in the relationship did not exacerbate any adverse effects that posttraumatic stress symptoms (experienced by either individuals or their partner) had on an individuals' relationship quality. The theoretical and practical implications and applications of these findings are discussed.

Chapter 1

The Canterbury Earthquakes

At 4:35 am on September 4th, 2010, a 7.1 magnitude earthquake struck 40 km west of Christchurch, New Zealand's second largest city. The earthquake caused significant damage in the city and the Canterbury region, but remarkably, no loss of life occurred. Strong aftershocks continued to hit the area, including a severe 6.3 magnitude earthquake at 12.51 pm, on February 22nd, 2011. The epicentre of this earthquake was much closer to the city and resulted in 185 deaths, 6, 659 moderate to severe injuries, and thousands of minor injuries (Ardagh et al., 2012). Damage was widespread in the central business district and across the city. In addition to significant damage to buildings and land, infrastructure, sewerage, and water supply were severely affected, causing major disruption to the daily lives of residents. During the first year following the September 2010 earthquake, aftershocks served as a continuous reminder of the main earthquakes. Over 10,000 aftershocks measuring magnitude 2.0 or above were recorded (which averages to around 27 aftershocks per day) with 301 aftershocks measuring magnitude 4.0 or above and 23 measuring magnitude 5.0 or above (GNS Science, 2014). The estimated cost of the earthquake sequence is around NZ$30 billion dollars (see McColl & Burkle, 2012; Ardagh, et al., 2012).

The aftermath of the earthquakes continued to affect Christchurch residents after the first year. Although the number of aftershocks declined sharply over time, over 3,000 aftershocks (≥ magnitude 2.0) were recorded during the 15 month time frame of the current study (November 2011 – March 2013), with 83 aftershocks measuring magnitude 4.0 or above and 8 aftershocks exceeding a magnitude 5.0 (GNS Science, 2014). In March 2012, 'aftershocks' was still the most frequently selected earthquake-related stressor (ticked by 57%, out of a list of 43 possible stressors) by participants from a community sample of Christchurch residents (Marshall, Frazier, Frankfurt, & Kuijer, 2014). In addition to the aftershocks,

residents continued to face other ongoing stressors related to the earthquakes including fixing residential damage, damage to road/infrastructure, financial pressures, changes to neighbourhoods, not being able to get information that was needed, and not being able to go to usual places due to earthquake related closure (see Kuijer, Marshall, & Bishop, 2014; Marshall et al., 2014).

Unfortunately, exposure to a natural disaster, such as this, is not uncommon. For example, Briere and Elliott (2000) found the life time prevalence rate for experiencing a natural disaster to be 22% amongst a general population sample in the United States of America (USA). A large body of research has found that individuals are vulnerable to experiencing a number of negative psychological reactions postdisaster (e.g., posttraumatic stress disorder/symptoms, general distress, depression/depressive symptoms; see Bonanno, Brewin, Kaniasty, & LaGreca, 2010; Neria, Galea, & Norris, 2009; Neria, Nandi, & Galea, 2008; Norris et al., 2002 for reviews). A more recent but rapidly growing body of research has found that many individuals not only experience negative psychological reactions but they also experience positive reactions (e.g., posttraumatic growth, e.g., Marshall et al., 2014; McMillian, Smith, & Fisher, 1997; Xu & Liao, 2011). Much less research, however, has looked at the impact of traumatic events on significant relationships, such as intimate (or romantic) adult relationships (e.g., committed partners or spouses). This is surprising given that intimate relationships are amongst the most important relationships in our life, having a profound impact on our health and wellbeing (see Bradbury & Karney, 2013). To illustrate, Coyne et al. (2001) found that marital quality predicted four-year survival rates in congestive heart failure patients at a similar strength to the severity of the condition.

In a natural prospective study, Cohan and Cole (2002) examined family changes postdisaster by comparing the areas affected by Hurricane Hugo (a severe class four storm that occurred in South Carolina, USA, in 1989) to areas that were not affected. The results were

striking. Rates of births, marriages, *and* divorce were significantly higher in the affected areas than the areas not affected in the years following the natural disaster. This compelling study demonstrates how a natural disaster can have a profound (and mixed) effect on intimate relationships

The current thesis is an extension of Cohan and Cole's (2002) research. More specifically, I first investigate how the Canterbury earthquakes have impacted individuals' relationship quality. Second, I aim to identify individuals whose relationship quality is resilient postearthquake by focussing on social support exchanges within the relationship as a potential posttrauma resource. This aim is particularly important as identification of resilient individuals/couples postdisaster and their distinguishing characteristics are invaluable for future intervention and prevention efforts. Before I explain the current study in more detail, however, it is important to understand the context of the current study. Thus, in this Chapter, I discuss what exposure to a natural disaster entails, using examples relating to the Canterbury earthquakes.

Exposure to a Natural Disaster

Exposure to a natural disaster (or disaster in general) causes various objective and subjective stressors. This section explores the actual stressors experienced in relation to a disaster, which can be separated into traumatic stressors, resource loss, and ongoing adversities (Norris &Wind, 2009). In addition, to the actual stressors experienced postdisaster, this section discusses the experience of trauma-related stress (i.e., the emotional, behavioural, physiological, and cognitive responses to the traumatic event) or posttraumatic stress symptoms/disorder.

The Stressors Experienced.

Traumatic stressors. An event that exposes an individual to actual or threatened death, serious injury, or sexual violation is considered to be a traumatic event. This exposure can be

experienced by the individual directly or indirectly (e.g., by witnessing another individual experiencing a traumatic event, learning that a close friend or family member has experienced it, or by hearing repeatedly about what occurred during a traumatic event (American Psychiatric Association [APA], 1994; 2000; 2013). It is not surprising that natural disasters, and more specifically the Canterbury earthquakes, have the potential to be a traumatic event.

Although nobody died as a result of the first Canterbury earthquake, 185 individuals died and thousands more were injured as a result of the second earthquake. It is also relatively common to feel that one's life and physical integrity is threatened during natural disasters. For example, nearly half (47%) of the participants from a community sample of Christchurch residents surveyed one month after the September 2010 earthquake reported that they had feared for their life during the main earthquake. When surveyed again three months after the February 2011 earthquake, 35% of the sample reported having feared for their life during this earthquake (Kuijer et al., 2014). Furthermore, many individuals witnessed others being injured as a result of the disaster. This was a common theme in stories recounted to the media following the February 2011 earthquake; for example, "We were just standing in the middle of the street and other people [were] coming from buildings, some of them injured. A group of people were trying to get someone out of a crushed car and down the road some policemen were trying to get someone out of a crushed car" a woman said whilst recounting her experience of the earthquake (Stuff & NZPA, 2011). Finally, although less common, it is possible to experience hearing first hand repeated or extreme exposure about the traumatic event. McColl and Burkle (2012) noted that residents frequently talked about the Canterbury earthquakes, reflecting on their experiences. Moreover the media had significant and prolonged coverage of the earthquakes in the following months.

Resource Loss. Hobfoll's (1989; 1991) Theory of Conservation of Resources (COR) argues that people strive to obtain, protect, and further resources. The term *resources* is

broadly defined and refers to objects (e.g., housing), personal resources (e.g., self-esteem), conditions (e.g., employment), or energies (e.g., free time). Under this assumption, he argues that psychological stress occurs when there is (a) the threat of a net loss of resources, (b) actual net loss of resources, or (c) a lack of resource gain after resource investment. A common feature of natural disasters is the loss of material resources and the Canterbury earthquakes were no exception. For example, Parker and Steenkamp (2012) estimated that 150,000 residential homes, representing three quarters of the housing market, were damaged following the Canterbury earthquakes and NZD$7 billion worth of claims were made to the government's Earthquake Commission (EQC). In regards to job loss, it has been estimated that employment in the Canterbury region declined by 9% between June 2010 and June 2012 (see Parker and Steenkamp, 2012). Personal loss, as outlined in Hobfoll's (1989; 1991) COR Theory, is rarely studied postdisaster (see Sattler et al. 2006 for an exception), however, one could consider a decrease in well-being (or increase in distress) as a marker of loss of personal resources, which I discuss below in a later section.

Ongoing adversities. Although natural disasters strike suddenly and stop relatively soon thereafter, residents have to cope with various adversities that result from the disaster in the days, months, and even years following. Thus, a disaster results in acute stressors, which have an identifiable onset and possible endpoint *and* chronic stressors, which are more stable aspects of the environment (see Karney & Neff, 2013). As discussed above, approximately 150,000 residential homes were damaged by the Canterbury earthquakes (Parker and Steenkamp, 2012). Consequently, many residents were faced with stressors such as having to relocate either temporarily or permanently, living in damaged property for a prolonged period of time, waiting for claims to be assessed, tolerating builders in their house etcetera. The earthquakes also resulted in other chronic stressors such as dealing with insurance claims and government officials, aftershocks, and increases in traffic congestion (see Kuijer et al. 2014 for

a scale developed to assess ongoing stressors experienced by Canterbury residents postearthquakes). Twelve months after the February 2011 earthquake, participants from a community sample of Christchurch residents reported experiencing on average 8.28 ongoing earthquake-related hassles/stressors (possible range 0 – 43; e.g., "living in a damaged house", "damage to road/infrastructure", "fixing house/property", "financial pressures", "difficulties sleeping") (Marshall et al., 2014).

The Experience of Stress. Lazarus and colleagues (e.g., Lazarus, 1966; Lazarus & Folkman, 1984) argue that the experience of stress (emotional, behavioural, physiological, and cognitive responses) following a potential stressor depends on the *appraisal* of the event not the event itself. Therefore, it is important to consider not only the stressors experienced but also the experience of trauma-related stress (or posttraumatic stress disorder/symptoms).

Posttraumatic Stress Disorder and Symptoms. Posttraumatic stress disorder/symptoms are the most commonly experienced stress responses postdisaster (Norris et al. 2002; Galea, Nandi & Vlahov, 2005; Bonanno et al., 2010). Posttraumatic stress disorder (PTSD) is characterized by significant anxiety, fear, helplessness, or horror manifested through three different symptom clusters: re-experiencing the event, avoiding stimuli associated with the trauma, and physical hyperarousal (APA, 1994; 2000; 2013). There is significant variability in the prevalence rates of posttraumatic stress disorder after the occurrence of natural disasters. Galea et al. (2005) reported prevalence rates ranging from 5% to 60% in the first one to two years postdisaster. The majority of studies, however, reported prevalence rates at the lower end of this range. In context of the Canterbury earthquakes, Fergusson, Horwood, Boden, and Mulder (2014) found that for every one step increase in earthquake exposure (out of a five-step measure, ranging from not exposed to high exposure) individuals were 1.25 times more likely to have posttraumatic stress disorder. Kuijer et al., (2014), using Creamer, Bell, & Failla's (2003) cut-off of 1.5 for the Impact of Events Scale-

Revised (IES-R, Weiss & Marmar, 1997) found a prevalence rate of 15% one month post-September 2010 earthquake and 22% three months post-February 2011 earthquake.

Despite the relatively low prevalence of individuals meeting the criterion of posttraumatic stress disorder postdisaster, it is evident that individuals are vulnerable to experiencing subclinical symptoms postdisaster, referred to as posttraumatic stress symptoms. Using sophisticated analyses (e.g., Latent Class Growth Mixture Modelling, LCGM, or Group Based Trajectory Modelling, GBTM), Norris, Tracy, and Galea (2009) found that most individuals experience either low, stable posttraumatic stress symptoms postdisaster or initially moderate-severe symptoms that decline abruptly over time, whereas a minority show moderate-severe stable or slowly recovering symptoms. Although most experience low or recovering posttraumatic stress symptoms, research has found that posttraumatic stress symptoms do actually increase in response to experiencing a disaster. Nolen-Hoeksema and Morrow (1991) investigated posttraumatic stress symptoms in a sample of undergraduate students after the 7.1 earthquake that occurred in Loma Prieta, San Francisco (USA) on October 17, 1989. Students were given the Interview to Diagnose Depression pre and postearthquake. Using items pertaining to posttraumatic stress symptoms, the researchers found that posttraumatic stress symptoms significantly increased following the earthquake. In the context of the Canterbury earthquakes, Kuijer et al. (2014) found that one month following the September 2010 earthquake, participants reported an average of 0.87 (*SD* = 0.67, possible range 0 - 4) of posttraumatic stress symptoms and 0.93 (*SD* = 0.70) three months following the February 2011 earthquake. These results suggest that although a minority of individuals experience posttraumatic stress disorder postdisaster, it is common to experience at least some subclinical level of posttraumatic stress symptoms.

Chapter Summary

In conclusion, natural disasters can result in a diverse range of disaster-related stressors that are both acute (e.g., loss of material resources) and chronic (e.g., ongoing earthquake-related stressors). Furthermore, they can result in the more subjective experience of disaster-related stress (posttraumatic stress symptoms). The Canterbury earthquakes were no exception. The aim of the current study was to determine how the experience of earthquake-related stressors and stress impacts on individuals' intimate relationship quality. Before introducing the current study, Chapter 2 reviews the theories that explain how stress can impact relationship quality and the literature examining how experiencing a traumatic event impacts individuals' relationship quality. As mentioned prior, Cohan and Cole (2002) found that both births and marriages increased posthurricane. This suggests that not all individuals or couples experience the same relationship outcome postdisaster. Chapter 3 discusses this notion further and investigates a possible moderator of the stress/trauma and relationship quality association – support exchanges within the relationship.

Chapter 2

Standing on Shaky Ground? The Impact of the Canterbury Earthquakes on Intimate Relationship Quality

Chapter 1 discussed the potential stressors and stress that can result from experiencing a natural disaster, however, the primary question of the current study is: *How do these earthquake-related stressors and stress impact individuals' relationship quality?* A number of theories have been developed to explain how the experience of stressors and stress can impact on intimate relationships. This Chapter first discusses the two major theoretical frameworks that explain how stressors experienced by an individual can affect relationship quality, which will serve as foundation for the current study. Following this, the literature examining the association between trauma and relationship quality is reviewed. Finally, the current study is introduced, followed by the Hypotheses, Method, Results, and Discussion sections of Part 1. Part 2 is introduced in Chapter 3.

Stress – Relationship Theories

In this section, I outline the two major theoretical frameworks that explain how stressors/stress can impact on romantic relationships: the Vulnerability-Stress-Adaption Model (VSA; Karney & Bradbury, 1995) and the Stress Spillover and Stress Crossover (see Karney & Neff, 2013 for a review). Following this, I outline how these theories apply to the context of the current study.

The Vulnerability-Stress-Adaption Model. Karney and Bradbury (1995) developed the VSA Model following a rigorous review of 115 longitudinal studies assessing the possible predictors of relationship quality and stability. This model takes both a cognitive *and* behavioural perspective.

According to the VSA model (see Figure 1), stress exerts its effect on relationship quality/stability by influencing or changing the adaptive processes that occur within an

intimate relationship, these processes being broadly defined as the ways in which partners communicate and interact with the other partner, in addition to the thoughts each partner has about each other and the relationship. Thus, stress impacts relationship quality because of the way it affects interactions, communication, and cognition within the relationship. Although their review revealed that stress negatively impacts couples' relationship quality and stability on average, Karney and Bradbury (1995) do emphasize that stress does not necessarily impact all relationships in the same way (e.g., due to the influence of enduring vulnerabilities of one or both partners, such as personality and demographics). The notion that not all couples may experience negative relationship outcomes poststressor is discussed in further detail in Chapter 3.

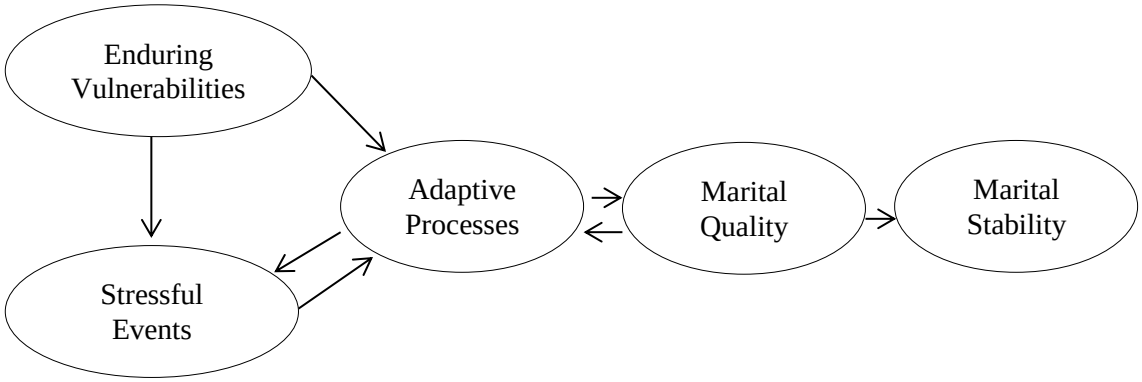

Figure 1 *The Vulnerability-Stress-Adaption (VSA) Model adapted from Karney and Bradbury (1995)*

Stress Spillover and Stress Crossover. The major limitation of the VSA Model noted by Karney and Neff (2013) is that it does not consider the diverse ways in which stress can impact an intimate relationship. Because the model is not dyadic (i.e., it does not consider both members in the dyad separately), but instead focuses on the couple as the unit of analysis, it leads to the assumption that each partner in an intimate relationship experience stress equally, however, this is not plausible. Most often only one partner may experience stress whilst the other partner does not experience stress or experiences it to a lesser extent. As alluded to in Chapter 1, not all individuals experience the same level of disaster exposure

and inter-individual rates of posttraumatic stress disorder/symptoms vary significantly postdisaster.

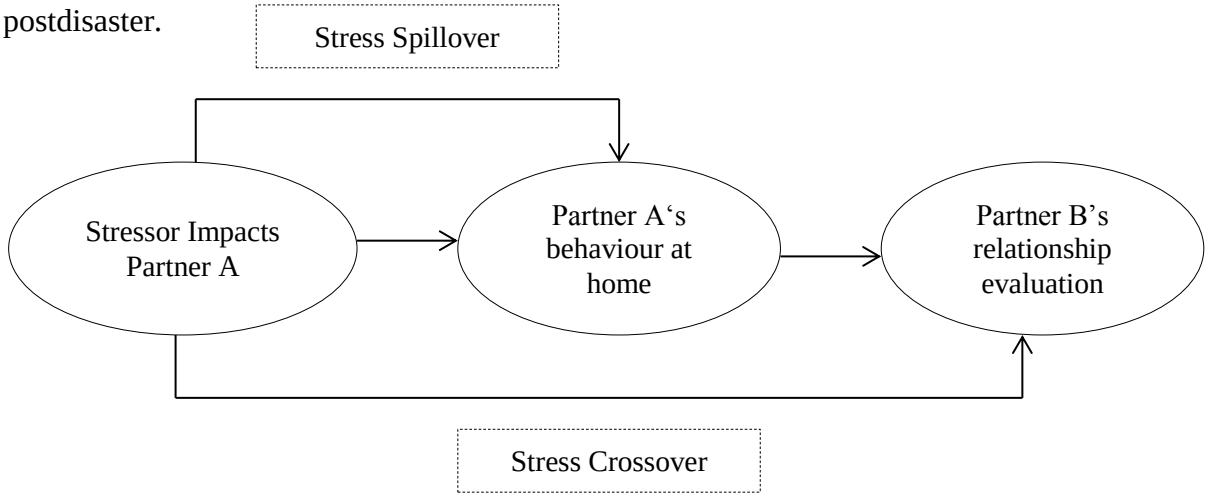

Figure 2 *A dyadic model of the Stress Spillover and Crossover Framework adapted from Karney and Neff (2013)*

The stress spillover and stress crossover framework, on the other hand, takes a dyadic perspective and considers how stress impacts a couple when stress is experienced uniquely or differentially by the partners (see Karney & Neff, 2013 for a recent review; also see Figure 2). Stress spillover occurs when one partner (actor) experiences a stressor (external to the relationship), which in turn affects how they interact and communicate with their partner. Stress crossover, however, is where the impact of stress on relationships "becomes uniquely dyadic" (Karney & Neff, 2013, p. 669). More specifically, a stress crossover occurs when the stressor directly experienced by one partner (actor) is transferred to his or her partner (who is not directly exposed to the same stressor or not directly experiencing the same level of stress) via the actor's behaviours towards the partner. Thus, a stress spillover occurs when experienced stress *directly* impacts on a person's relationship quality, whereas a stress crossover occurs when stress *indirectly* impacts on a person's relationship quality via the partner's experience and resulting behaviour.

Consider a hypothetical example applied to the context of the earthquakes. Allie and Ben are in a romantic relationship. The earthquake led to a number of changes to Allie's

work. Her original work premises were significantly damaged and she had to move from temporary workplace to temporary workplace. In addition, because she worked at a building firm, her workload has increased dramatically. She also experienced other stresses related to the earthquake, such as increased time spent in traffic, aftershocks, damage to the family home and so on. She felt very stressed, frustrated, uptight, and upset. When she came home, she did not feel like giving nor actually have the time to give Ben affection and attention – often withdrawing straight to the bedroom. She was also easily frustrated and was constantly snapping at him to do more around the house. Given this, she felt that they were less intimate as a couple and did not feel satisfied with the relationship (an example of a stress spillover). What about Ben's perspective? Well, understandably, Ben found his interactions with Allie difficult. Over time, he began to feel less connected with Allie and felt that their relationship quality was declining as a result (an example of a stress crossover).

This theory has an important implication for research investigating stress and relationship associations. When understanding how a person's relationship quality is impacted by stress, it is important to consider both his/her level of stress *and* his/her partner's level of stress. This aligns with a foundational intimate relationship theory - Interdependence Theory pioneered by Kelley and Thibaut (1978; Thibaut & Kelley, 1959). The major premise of this theory is that the way one partner in an intimate relationship thinks, feels, and ultimately behaves has a strong influence on the other partner's thoughts, feelings, and behaviours (see Arriaga, 2013 for a detailed and recent discussion of this theory applied to close relationships). Although this concept of interdependence between partners is not new, research that investigates how a person's partner predicts a variety of his/her outcomes or responses to a situation has only been conducted relatively recently. The now emerging literature is largely due to the introduction of the Actor-Partner Interdependence Model (APIM; see Kenny, Kashy, & Cook, 2006; Kenny, 1996), which enabled researchers to

examine within-person effects (or actor effects), whereby one person's score on a predictor variable affects his/her score on an outcome variable, in addition to between-person effects (or partner effects), whereby a person's score on a predictor variable affects his/her partner's score on an outcome variable (controlling for the partner's score and person's own score respectively; Kenny, 1996; Kenny et al. 2006). The situation where research seeks to accurately investigate both actor *and* partner effects of stress on relationship quality is no different and a pioneering example is Neff and Karney (2007) one of the first studies to assess stress crossover effects, whist controlling for the target person's own stress.

Theory Applied to the Current Study. The theories reviewed above suggest that the experience of stressors and stress, such as those consequent upon the Canterbury earthquakes, can have a meaningful impact on relationship quality by changing the way in which couples interact and think about each other and their relationship. The stress spillover and stress crossover framework demonstrates the importance of taking a dyadic perspective (i.e., considering both partners) to truly capture the diverse ways in which stress can impact a relationship. Following from this, the current study examines how the Canterbury earthquake stressors (traumatic exposure, loss of material resources, and ongoing hassles) and earthquake-related stress (posttraumatic stress symptoms) experienced by individuals (actor effect, path A in Figure 3) and their partners (partner effect; path B in Figure 3) impact their relationship quality. Before the current study is discussed in more detail, I first provide an overview of the trauma literature assessing how the trauma experience impacts relationship quality.

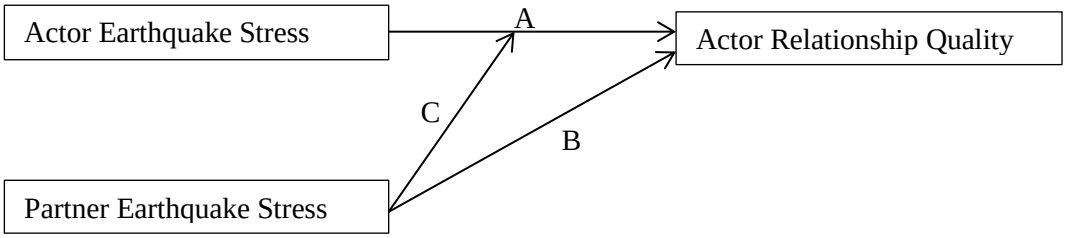

Figure 3 *A dyadic model depicting within-actor earthquake stress effects (path A), between-partner earthquake stress effects (path B), and actor by partner earthquake stress effects (path C), predicting actor's relationship quality.*

The Trauma – Relationship Quality Literature

The following review is designed to give an overview of the different studies that have aimed to determine the impact of a traumatic event on relationship quality. As discussed above, an event that either indirectly or directly exposes an individual to actual or threatened death, serious injury, or sexual violation is considered to be a traumatic event (APA, 1994; 2000; 2013). It is important to note that some studies have been excluded from the current review because they did not identify that they were examining a traumatic event (i.e., the keywords *"trauma"* or *"traumatic event"* were used as search terms). For example, it was not until the early 1990s (APA, 1994) that illness (e.g., cancer) and injury (e.g., traumatic brain injury) were considered to be traumatic events for both the patient and their spouse. This review, therefore, does not fully cover certain traumas (i.e., unexpected death of a loved one, sexual abuse, or health-related trauma). It does, however, provide an overview of the different types of studies conducted in a trauma context, with a particular focus on the traumatic event most relevant to the current study – natural disasters. A separate review using the keywords *"natural disaster"* and *"disaster"* was also conducted and the results combined with the previous search.

The literature covered was constrained in several important ways. First, only studies examining traumatic events to which at least one partner was *directly* exposed were included in the review. In addition, studies examining traumatic events resulting from the behaviour of one of the partners (e.g., domestic violence) were excluded. Second, in regards to the outcome variable – relationship quality – I included studies using measures of relationship/marital quality (e.g., Perceived Relationship Quality Components Inventory, PRQC; Fletcher, Simpson, & Thomas, 2000), satisfaction (e.g., Relationship Satisfaction Scale, RAS; Hendrick, 1988), adjustment (e.g., Dyadic Adjustment Scale, DAS; Spanier, 1976), or problems (e.g., Marital Problems Index, Jordan et al. 1992) (as per Lambert, Engh,

Hasbun, & Holzer's 2012 findings). Further, following Karney and Bradbury's (1995) Vulnerability-Stress-Adaption Model which distinguishes between adaptive measures and relationship quality/evaluations, studies that *only* or *specifically* measured adaptive processes (e.g., positive or negative interactions) were omitted. It is important to note that many popular questionnaires designed and used to measure more general relationship evaluations or quality include questions assessing more specific adaptive processes that occur in the relationship (e.g., DAS; Marital Problems Index). The implications of this are discussed further in the 'Methodological Limitations' section below. Studies that created an aggregate score of husbands' and wives' relationship quality were also excluded as they do not allow examination of actor and partner effects (see below for more detail). Third, some studies (e.g., Reizer, Possick, & Ein-Dor, 2010) assess how general distress impacts relationship quality in a sample of individuals who have experienced a traumatic event. However, these have been excluded from the current review as general distress is not a measure that is specifically associated with the traumatic event.

Because the current study takes a dyadic perspective, the literature examining simple (i.e., bivariate correlations) actor trauma experience effects (path A in Figure 3, p. 13) then partner effects (path B in Figure 3, p. 13) is examined first. Following this, research reporting more rigorous actor and partner effect analyses (i.e., analyses that test actor effects whilst controlling for partner effects and vice versa) is reviewed. Finally, the issues and gaps within the existing literature are discussed, followed by a consideration of whether trauma impacts relationship quality men and women differently.

Actor Effects.

Posttraumatic Stress Disorder/Symptoms. The majority of the research examining the association between traumatic event exposure and relationship quality focuses on the association between posttraumatic stress disorder/symptoms and relationship quality. Taft,

Watkins, Stafford, Street, and Monson (2011) conducted a meta-analysis on 14 studies (*N* = 7, 485) that investigated the link between individuals' posttraumatic stress disorder/symptoms and their 'relationship discord' (measured predominantly by the Dyadic Adjustment Scale). Of the studies found, all but two examined military samples. Consequently, most studies examined male trauma victims, and only a few studies examined female trauma victims (seven studies) or both males and females (four studies). The mean true score correlation (ρ) found was .40 (SDρ = .11), a moderate effect size using Cohen's (1988) estimates. Thus, the higher the posttraumatic stress symptoms experienced by individuals the higher their reports of relationship discord.

Following this meta-analysis (i.e., following the most recent study included in Taft's et al., 2011 meta-analysis, which was conducted in 2009), a number of studies have investigated the link between individuals' posttraumatic stress symptoms and their relationship quality (Allen, Rhoades, Stanley, & Markman, 2010; Bergmann, Renshaw, Allen, Markman, & Stanley, 2014; Campbell & Renshaw, 2013; Erbes, Meis, Polusny, & Compton, 2011; Fredman et al. 2010; Gewirtz, Polusny, DeGarmo, Khaylis, & Erbes, 2010; Khaylis, Polusny, Erbes, Gewirtz, & Rath, 2011; Meis, Erbes, Polusny, & Compton, 2010; Watts et al., 2011; Zerach, Anat, Solomon, & Heruti, 2010). Of these studies, most examined military samples (Allen et al., 2010; Bergmann et al., 2014; Campbell & Renshaw, 2013; Erbes et al., 2011; Gewirtz et al., 2010; Khaylis et al., 2011; Meis et al. 2010; Zerach et al. 2010). Only two studies examined other traumas, including severe flooding (Fredman et al. 2010) and a heightened risk of developing breast/ovarian cancer (Watts et al., 2011). All but two studies (Watts et al., 2011; Zerarch et al., 2010) found a moderately strong association between individuals' posttraumatic stress symptoms and their relationship quality, such that higher reports of posttraumatic stress symptoms by individuals were associated with lower self-reports of relationship quality. Overall, the studies demonstrate that individuals'

posttraumatic stress symptoms are negatively associated with their relationship quality, and this effect size is moderate

Other Trauma Impact Measures. Despite most research focusing on posttraumatic stress disorder/symptoms, some studies have examined how more objective trauma factors experienced by individuals impacts their reported relationship quality. This is typically done by including either (a) a simple frequency or checklist of trauma exposure (e.g., participants are asked to indicate whether they experienced various traumatic events, Allen et al., 2010; Anders, Shallcross, & Frazier, 2012; Broman, Riba, Trahan, 1996; Godbout, Lussier, & Sabourin, 2006; Nelson Goff, Crow, Reisbig, & Hamilton, 2007; Whisman, 2006) or (b) questions pertaining to the experience or content of the trauma (e.g., threat/harm, injury, material loss experienced; Allen, Rhoades, Stanley, & Markman, 2011; Fredman et al., 2010; Gewirtz et al., 2010; Nelson Goff et al., 2007).

In regards to those studies using the former method, the majority (Anders et al., 2012; Broman et al., 1996; Godbout et al., 2006; Whisman, 2006) used a community sample and assessed either a frequency of traumatic events experienced (e.g., using the Traumatic Events Questionnaire; Vrana & Lauterbach, 1994) or whether or not participants had experienced a specific traumatic event. One study (Allen et al., 2010) investigated a military population and recorded whether the participants had been recently (within the last year) deployed or not. Finally, Nelson Goff et al. (2007) investigated a range of traumatic events experienced in a military sample. The results of these studies are mixed. For example, a number of studies (Allen et al., 2010; Anders et al., 2012; Broman et al., 1996; Godbout et al., 2006; Nelson Goff et al., 2007; Whisman, 2006) found no significant association between experiencing a traumatic event (e.g., recent deployment, Allen et al., 2010; a non-relational trauma [i.e., natural disaster] Anders et al., 2010; various childhood traumatic events [i.e., abuse, accident, sexual abuse], Godbout et al., 2006; Whisman, et al., 2006; death of a child or illness;

Broman et al., 1996) and relationship quality. However, relational trauma (e.g., loved one experienced a serious accident/injury/illness; Anders et al., 2012), being attacked (Broman et al., 1996), being a victim of physical or psychological abuse in childhood (Godbout et al., 2006), and experiencing childhood rape or sexual molestation (Whisman, 2006) were significantly associated with lowered relationship quality.

In regards to the studies using the second method (assessing trauma content/experiences), the majority investigated military samples (Allen et al., 2011; Gewirtz et al., 2010; Nelson Goff et al., 2007) and one (Fredman et al., 2010) examined a sample of women who had experienced a severe flood. Allen et al. (2011) examined the effect of stress-related to deployment (participants rated how stressful they found various issues associated with deployment) and found higher stress experienced by either partner was associated with lower self-reported relationship quality. Gewirtz et al. (2010), however, assessed whether their sample of military men had been injured during deployment, and this was not significantly associated with their relationship quality. Nelson Goff et al. (2007) found significant negative associations between male army soldiers' trauma symptoms (including, anxiety, dissociation, depression, sexual problems, sexual abuse trauma, sexual problems and sleep disturbance) and their relationship quality. Finally Fredman et al. (2010) assessed threat/harm and material loss experienced from a flood. A significant negative association was found between women's reported threat/harm and their relationship quality, whereas a significant but *positive* association was found between material loss and relationship quality.

Finally, some studies investigate possible changes in relationship quality. Most studies achieved this by using control groups (Bishop et al., 2007; Burridge, Williams, Yates, Harris, & Ward, 2007; Dekel, Enoch, & Solomon, 2008; DiLillo & Long, 1999; Kuijer, Buunk & Ybema, 2001; Tuinman, Fleer, Sleijfer, Hoekstra, & Hoekstra-Weebers, 2005) and

a few used retrospective accounts of relationship quality change (Kuijer, et al, 2001; Mo et al., 1992) or pre- and posttrauma assessments (Cigrang et al., 2014).

Of the studies using control groups, one study (Dekel et al., 2008) compared veterans who were prisoners of war with veterans who were not prisoners of war, and another (Tuinman et al., 2005) compared couples including a male partner who was undergoing treatment for testicular cancer with couples including a survivor of testicular cancer. Finally, four studies compared individuals/couples who had experienced a trauma (i.e., traumatic brain injury, childhood abuse, cancer, respectively) to those who had not (Burridge et al., 2007; Hinnen, Hagedoorn, Ranchor, & Sanderman, 2008; DiLillo & Long, 1999; Kuijer et al., 2001). The results were mixed with three studies finding that those exposed to trauma reported lower relationship quality compared to those not exposed to trauma (Burridge et al., 2007; Dekel et al, 2008; DiLillo & Lang, 1999), and three studies finding no differences between the trauma exposed group and comparison group (Hinnen et al., 2008; Kuijer et al., 2001; Tuinman et al., 2005).

Mo et al. (1992) used retrospective reports on whether a health-related trauma (testicular cancer and Hodgkin's disease) led to a change in relationship quality. The majority of both patients and partners said that their relationship had drawn closer following the traumatic event, whereas a minority said that it had pulled them apart or had not changed their relationship. Similarly, Kuijer et al. (2001) found that most couples facing cancer felt that their relationship had improved since the onset of the illness. Finally, Cigrang et al. (2014) examined a military (individuals) sample pre- and postdeployment and found that relationship quality decreased pre to postdeployment.

Overall, these studies provide a very mixed message on how experiencing trauma impacts individuals' relationship quality. On the one hand, a number of studies find no association between the experience of trauma and relationship quality and on the other hand,

a relatively equal number find a negative association. It is also noteworthy that some studies (Mo et al., 1992; Fredman et al., 2010; Kuijer et al, 2001) suggest that experiencing a trauma can have a positive effect on relationship quality.

Partner Effects.

Posttraumatic Stress Disorder/Symptoms. Lambert et al. (2012) conducted a meta-analysis on 22 studies (N = 3, 421 couples) examining the links between individuals who experienced a traumatic event and their partner's relationship quality. Of these studies, most (15 studies) examined male military samples and one study examined a female military sample. Six studies examined women who had experienced a range of traumatic events (e.g., child abuse, traffic accidents, and refugee-related trauma). Overall, they found a small to moderate effect size of -.24.

Since 2011 (the most recent studies included in Lambert et al., 2012), a few studies examining partner posttraumatic stress symptom effects have been conducted (Bergmann et al., 2014; Campbell & Renshaw, 2012; Campbell & Renshaw, 2013; Renshaw & Campbell, 2011). All but one of these studies examined military populations, and the majority (Bergmann et al., 2014; Campbell & Renshaw, 2012; Renshaw & Campbell, 2011) found that a partner's posttraumatic stress symptoms were significantly and negatively associated with individuals' self-reported relationship quality (one study found a non-significant association: Campbell & Renshaw, 2013).

Taken together, these studies consistently show that posttraumatic stress symptoms experienced by one partner are negatively associated with reported relationship quality of the other partner. Perhaps not surprisingly, partner effects are typically not as strong as actor effects.

Other Trauma Impact Measures. Very few studies have examined partner effects using other trauma impact measures. One study investigated the effect of partner trauma

experience on the other partner's relationship quality. Dekel et al. (2008) did not find a significant difference in relationship quality between wives of former prisoners of war and wives of veterans who had not been prisoners of war.

Nelson Goff et al. (2007) examined the impact of frequency of trauma exposure experienced by soldiers and found no significant association with partner reported relationship quality. They also examined partner effects of traumatic symptoms: Soldier reported dissociation and anxiety was significantly and negatively associated with spouse relationship quality, but the remainder of the variables (depression, sexual problems, sexual abuse trauma, sexual problems and sleep disturbance) were not.

Rigorous Actor and Partner Effect Analyses. The above review reports studies that investigated actor and partner effects with analyses (i.e., bivariate correlations) that do not control for any other variables. I now turn to a discussion of the studies that have conducted more rigorous analyses. When assessing partner stress effects, it is important to control for actor stress to determine whether partner stress has a unique influence on relationship quality above and beyond actor stress (and vice versa for actor effects; see Kenny et al., 2006; Kenny, 1996 for a discussion of the APIM, and see Neff and Karney, 2007 for an example applied to a stress context). Few studies have conducted such analyses. This, however, is not surprising given that the majority of studies examine situations in which only one partner was exposed to the traumatic event (e.g., military trauma). Consequently, many studies include both partners but only assess the trauma impact of one partner (the partner directly exposed to the traumatic event).

Blow et al. (2013) examined a sample of military couples and predicted each partner's relationship satisfaction according to their own (actor) and partner's alcohol use, posttraumatic stress symptoms, and depressive symptoms. In these analyses, only one effect was marginally significant - an actor effect (a spouse's posttraumatic stress symptoms

predicting his/her own relationship satisfaction). Klaric et al. (2011) examined clinical (i.e., those seeking treatment for posttraumatic stress symptoms) and non-clinical military couples. An actor effect for re-experiencing symptoms was found for wives, such that higher re-experiencing symptoms predicted *better* relationship adjustment. A significant partner effect for avoidance symptoms was also found, such that husbands' avoidance symptoms predicted *worse* relationship adjustment in the wives. No actor and partner effects were found for husbands (i.e., actor and partner posttraumatic stress symptoms predicting husbands' relationship satisfaction). As with Blow et al. (2013), all analyses controlled for both partners' depression and hostility. Finally, Monk and Nelson (2014) also controlled for both actor and partner trauma exposure effects in a sample of military couples that were categorized according to the frequency of disclosures made about the trauma (i.e., high or low/mixed disclosure). For both high and low/mixed disclosure couples, actor trauma symptoms were significant, such that higher symptoms experienced by soldiers and spouses had a negative impact on their own relationship quality. However, only one partner effect (soldiers' trauma symptoms to spouses' relationship quality) was marginally significant for the low/mixed disclosure sample. Thus, actor trauma symptoms had a significant negative association with relationship quality, regardless of the couple's disclosure. However, only partner trauma symptoms had a significant negative association when couples had low or mixed disclosure. High disclosure appeared to attenuate the partner trauma symptom effects.

Overall, the results of these studies using more rigorous data analytic approaches to actor and partner effects present an unclear message, however, one can infer from these findings that effects (in particular partner effects) are not strong. It should be highlighted that these studies conducted analyses that included other control variables (e.g., alcohol consumption, Blow et al. 2013) or analysed samples according to a moderating variable (e.g., disclosure, Monk & Nelson Goff, 2014). The use of control variables means that the unique

effects of actor and partner posttraumatic stress symptom effects are unknown as the variance for the other predictors is partialed out. Furthermore, Monk and Nelson Goff (2014) stated that their full model should be interpreted cautiously as power was relatively low. Further research using more this rigorous analytical approach is needed.

Considering the Traumatic Event. Comparing across different traumas may be misleading. There is no doubt that the experience of one trauma (i.e., the trauma content), such as combat, will be different than experiencing another trauma, such as a natural disaster. Thus, it is possible that the effect that trauma has on relationship quality differs across trauma types. Both meta-analyses (Lambert et al., 2012; Taft et al., 2011) discussed earlier found that actor (Taft et al.) and partner (Lambert et al.) effects of posttraumatic stress symptoms on relationship quality were greater amongst military samples than civilian samples. Furthermore, as discussed above, the experience of some traumatic events (e.g., non-relational trauma, Anders et al., 2012, or illness and death of a child, Broman et al., 1996) were not significantly associated with a person's relationship quality, whereas others were significantly and negatively associated (e.g., relational trauma, Anders et al., 2012, or an attack, Broman et al., 1996). Thus, there is evidence that different trauma types impact relationship quality differently.

As mentioned in the above review, the majority of the studies examined military samples. Thus, there is little research examining other trauma types. Further, very little is known about dual-trauma couples (i.e., couples where *both* partners directly experienced a trauma, see Alexander, 2014). And as discussed further below, studies examining collective traumas (e.g., natural disasters), which may have directly impacted both partners, tend to only examine one partner (e.g., Fredman et al., 2010). Another consequence of the focus on military samples is that a majority (see Taft et al., 2009; Lambert et al., 2011) of studies investigate how a man's experience of trauma impacts his or his partner's relationship quality

(where partners are typically women), and little is known about the impact of a woman's experience of a trauma on relationship quality.

Studies examining how a *natural disaster* impacts relationship quality are lacking. Only three such quantitative studies (Fredman et al., 2010; Monson, Gradus, La Bash, Griffin, & Resick, 2009; Taft et al., 2009) have been conducted to the best of my knowledge. Fredman et al. examined a sample of women postflood, the results of which were discussed above. To summarize, they found a significant negative association between women's posttraumatic stress symptoms and relationship quality and also found that their experienced threat/harm was significantly and negatively associated, whereas their experienced loss was significantly and *positively* associated with relationship quality (Taft et al., 2009 uses the same sample as this study and it does not add further information so it is excluded from further discussion). Monson et al. examined couples postflood, but they only examined the actor effect of posttraumatic stress symptoms amongst the wives in the sample. As with Fredman et al. (2010), a significant negative association was found between an individual's posttraumatic stress symptoms and their relationship quality.

One qualitative study (Lowe, Rhodes, & Scogilo, 2013) has also been conducted. This study, which examined 40 low income (mostly African American) women following Hurricane Katrina, provides a deeper analysis of how a natural disaster impacts relationship quality. The study found that 73% of the participants retrospectively reported the hurricane had a negative impact on their relationships. When asked what led to these changes, the explanations included stressors relating to employment (i.e., their partner became unemployed), living conditions, and their partner's psychological symptoms and negative behaviour (e.g., substance use/abuse, abandonment, abuse), and poorer adaptive processes (e.g., communication). Despite that the majority of participants reported that Hurricane Katrina had undermined their relationship, a minority (45%) reported that it had a positive

impact. The reasons given for this positive relationship change included improvement in employment, positive changes in perspectives, benefits in partners' mental health, and positive changes in adaptive process.

Overall, the quantitative studies assessing a natural disaster context suggest actor posttraumatic stress symptoms are associated with lowered relationship quality. However, there are mixed findings for more objective measures of disaster-related stressors. The quantitative studies are limited in many of the ways discussed earlier. For example, they only assessed actor effects in a sample of women (despite Monson et al., 2009 including both partners), so partner effects and actor effects in men postdisaster are unknown. In addition, both studies are cross-sectional (I expand on this in a forthcoming section). Finally, although Fredman et al. (2010) examined the effects of trauma exposure, material loss, and posttraumatic stress symptoms, the effect of ongoing trauma-related stressors (as outlined in Chapter 1) has not been examined quantitatively.

Lowe's et al. (2013) qualitative study suggests that a majority of individuals experience negative relationship changes postdisaster that are due to the presence of various disaster-related stressors and the experience of stress. Positive changes, however, are largely due to alleviations in stressors and the experience of stress. The results also highlight the importance of partner experienced stressors or stress when predicting a women's relationship outcome postdisaster. Further quantitative research should be conducted to ascertain the partner effects and the impact of more objective trauma measures.

Methodological Limitations.

Despite the advances in the literature over recent years, these studies are limited (some of these limitations have been touched on in the prior section). The first limitation of the literature pertains to measurement.

Measurement. As mentioned earlier, most research focuses on posttraumatic stress symptoms but, as a result, very little research examines the effect of the content/stressors resulting from the trauma experience (see Allen et al., 2011; Gewirtz et al., 2010 for exceptions). In regards to relationship quality, the majority of studies measure it using the Dyadic Adjustment Scale (Spanier, 1976). Despite its popularity, this scale has been criticised (cf. Fletcher et al., 2000) for being atheoretical and combining broad relationship evaluations with adaptive processes (e.g., communication). Relationship theory (e.g., the VSA Model discussed in Chapter 1, Karney & Bradbury, 1995) predicts that adaptive processes predict broader relationship evaluations and vice versa. Thus, a majority of studies are not measuring relationship quality per se, but are measuring both adaptive processes *and* relationship quality, which are theoretically distinct constructs.

Study Design. Both Taft et al. (2011) and Lambert et al. (2012) emphasized the need for longitudinal research in their meta-analyses. In the studies conducted following these meta-analyses, the majority were cross sectional, however, the longitudinal studies that have been conducted since these meta-analyses (Campbell & Renshaw, 2013; Erbes et al., 2011; Chigrang et al., 2014; Gewirtz et al., 2010; Meis et al., 2010) are still limited. First, only one study (Campbell & Renshaw, 2013) collected data on both partners. Second, despite the longitudinal design of these studies, they only have two time points, namely predeployment and postdeployment (Chigrang et al., 2014; Meis et al., 2010), during deployment and postdeployment (Gewirtz et al., 2010), or postdeployment (Campbell & Renshaw, 2013; Erbes et al., 2011). Although this is invaluable in answering a number of important questions, particularly those that assess pre- and posttrauma (Chigrang et al., 2014; Meis et al., 2010), no trauma studies to my knowledge have examined the trajectory of relationship quality posttrauma and how it may differ according to actor and partner trauma experiences.

Studies with three or more waves of data enable researchers to examine the trajectory of relationship quality in relation to both time and the trauma experience, allowing one to infer whether effects change over time or remain stable. For example, it is unknown whether individuals' relationship quality remains stable over time when they (or their partner) experience high levels of trauma-related stressors/stress or whether the effect changes over time (i.e., increases or decreases). Theorists McCubbin and Patterson (1983) have argued that the family adaption process for coping with a stressful event is dynamic and fluid. Thus, coping efforts can be exhausted or maximised over time, changing the relationship outcomes. Given this, it is plausible that the impact that a trauma-related stressor/stress has on relationship quality changes over time as well.

Actor by Partner Interactions. Given that the majority of the research, as discussed, investigates trauma in which only one partner is directly affected and very few studies examine actor and partner effects simultaneously, it is not surprising that very little is known about the interaction between actor and partner effects (see path C in Figure 3, p. 13). However, it is likely that actor by partner interactions may exist. For example, it is possible that relationship quality is particularly low if *both* partners experience high posttraumatic stress symptoms or trauma exposure in comparison to situations where only one partner experiences high posttraumatic stress symptoms. One study investigated this possibility. Klaric et al. (2011) found in their military sample of couples (a mixture of clinical and non-clinical cases) that the lowest dyadic adjustment for wives was when both they and their partners had posttraumatic stress disorder. Interestingly, this limitation is also a noted limitation of the more general stress – relationship quality literature, with few studies investigating this possibility (see Karney and Neff, 2013). The one general stress study conducted examining possible actor by partner section is expanded upon in a latter section.

Sex Differences. Taft et al. (2011) found no significant differences for sex in their meta-analysis examining actor posttraumatic stress symptom effects on relationship quality. However, Lambert et al. (2012) found a stronger association between *male* partner posttraumatic stress symptoms and their wives' relationship quality. They argued that this may be because female partners tend to be more attuned to the relationship, which leads them to change their relationship evaluations accordingly or because posttraumatic stress symptoms tend to manifest as more external symptoms (e.g., aggression, alcohol use/abuse) for men than women, who tend to experience more internalized symptoms. The meta-analysis also found that military samples – which were more likely to be male – reported a stronger effect on partner posttraumatic stress symptoms than civilian samples. Thus, this sex difference may be confounded with trauma severity. Furthermore, generalizability is limited, as discussed earlier, because the majority of the studies focus on male military samples, some of which also include typically female spouses. It is possible that sex differences change according to the sample (i.e., women trauma victims) and the trauma type (particularly whether it is a collective traumatic event impacting both partners).

Given the limitations in the trauma literature and resulting difficulty of drawing conclusions, discussion extends to the stress – relationship quality literature. Neff and Karney (2005) found (using both observational and diary data) that women were more skilled in providing support when their partners experienced more stress than usual in comparison to men. Neff and Karney (2007) examined a sample of newlywed couples and found that when spouses (both wives and husbands) were experiencing greater stress than normal, they reported decreases in their own satisfaction. However, only husbands experienced decreases in satisfaction when their spouse was experiencing higher stress than usual. A stress crossover did not exist for wives. However, if wives experienced higher stress than usual *and* their husbands also experienced higher stress than usual, they reported decreases in

satisfaction. Thus, it appears that few if any sex differences exist for actor stress. However, partner stress experienced by a female partner has a stronger influence on male partner's relationship satisfaction, whereas (as discussed above) a female partner is more strongly impacted if both she *and* her partner are experiencing stress. It appears as though women can indeed cope better with their partner's stress than men, but that these coping efforts dissolve and stress is particularly taxing when individuals have to cope concurrently with their own stress and that of their partners.

In conclusion, it seems unclear whether sex differences operate. Although it does seem clear that sex differences do not exist in actor effects (individuals' trauma experiences impacting on their own relationship quality), it is unclear on whether (and in what direction) sex differences exist in partner effects – particularly applied to trauma as opposed to less severe, more normative stress.

The Current Study

The current study was designed to extend current knowledge of how experiencing a traumatic event impacts relationship quality using a four-wave study assessing couples over a period 15 months following the Canterbury earthquakes. The results will be discussed in two parts. First, in Part 1, I aim to determine *how* the stressors experienced as a result of the Canterbury earthquakes impacted individuals' relationship quality on average. Once these average effects are documented, I will explore a possible posttrauma resource – support exchanges within the relationship – that might moderate the earthquake stressors - relationship quality effects in Part 2 (Chapter 3).

As noted prior, very little is known about the impact that a collective traumatic event (i.e., an event that can directly impact both spouses, such as a natural disaster) has on relationship quality. A further advantage of studying a collective trauma such as this is that it addresses the noted limitation that few studies have investigated female trauma victims.

Furthermore, it is important that research investigates both partners and considers the diverse ways in which stress can impact relationship quality. Few trauma context studies, however, have taken a dyadic perspective (examining both partner's stressors/stress in the couple dyad) using rigorous analysis, and none have examined a natural disaster specifically. Furthermore, no studies have examined effects across time. Thus, it is unknown whether individuals' relationship quality remains stable or changes (increases or decreases) over time, when they or their partner experiences trauma-related stressors or trauma-related stress. The current study addresses this by taking both a dyadic *and* a developmental (i.e., exploring progress across time) perspective using moderated growth curve models within an APIM (e.g., Kenny et al., 2006; Kenny, 1996) framework. Extending upon previous research further, the effects of both acute (e.g., loss of material resources and trauma exposure) and chronic (e.g., ongoing earthquake stressors) earthquake-related stressors are investigated as well as the subjective *experience* of earthquake-related stress (e.g., posttraumatic stress symptoms). Furthermore, the current study uses a measure of relationship quality (or evaluations) that is not confounded with adaptive processes (Fletcher et al., 2000).

Part 1 Hypotheses. In Part 1, the following hypotheses will be examined:

Hypothesis 1. Individuals experiencing higher levels of earthquake-related stressors (including loss of material resources, trauma exposure, ongoing earthquake-related hassles) and earthquake-related stress (posttraumatic stress symptoms) will report lower levels of relationship quality compared to those experiencing lower levels of earthquake-related stressors/stress (actor effect; see path A in Figure 3, p. 13).

Hypothesis 2. Individuals with a partner who is experiencing higher levels of earthquake-related stressors (including loss of material resources, trauma exposure, ongoing earthquake-related hassles) and earthquake-related stress (posttraumatic stress symptoms) will report lower levels of relationship quality compared to those with partners experiencing

lower levels of earthquake-related stressors/stress (after controlling for their own earthquake-related stress) (partner effect; see path B in Figure 3, p. 13). However, it is expected that this effect will not be as strong as the actor effect.

Hypothesis 3. Individuals experiencing higher earthquake-related stressors (including loss of material resources, trauma exposure, ongoing earthquake-related hassles) and earthquake-related stress (posttraumatic stress symptoms) with a partner who is also experiencing higher earthquake-related stressors/stress will have particularly low (i.e., the lowest) relationship quality (actor by partner interactions; see path C in Figure 3, p. 13).

For all hypotheses, it was expected that the experience of earthquake-related stress (i.e., posttraumatic stress symptoms) would be a stronger predictor of relationship quality than the actual experience of earthquake-related stressors (e.g., loss of material resources).

For actor, partner, and actor by partner effects, I explore whether sex differences exist and whether the effects change across time. Based on the general stress and trauma literature, it was expected that no sex differences would occur for actor effects. However, given the dearth of trauma studies assessing sex differences in partner effects or actor by partner effects, no specific sex differences predictions could be provided. Further, given that no trauma studies have assessed whether or how these effects might exist across time, no specific hypotheses regarding these could be provided. Thus, this aspect of the study is exploratory.

Method

Participants. Participants were heterosexual couples living in Christchurch, New Zealand. These couples were recruited to participate in a longitudinal study on "The impact of the Canterbury earthquakes on couples". Participating in the study involved both partners completing questionnaires four times (Time 1 – Time 4) over a period of 15 months (see Procedure for more detail). In addition, one partner of each couple completed a short

questionnaire on material loss as a result of the earthquakes prior to Time 1 (referred to here as Time 0). In total, 131 couples expressed an interest in the study and completed the material loss questionnaire (Time 0). Of those, 100 couples and 13 individuals (three men and ten women) completed the questionnaire at Time 1. Thereafter, 82 couples (and 11 individuals including, two men and nine women), 79 couples (and five individuals including, two men and three women), and 75 couples (and nine individuals including, three men and six women), completed questionnaires at Time 2, 3, and 4 respectively. Over the course of the study, 22 couples and 17 individuals failed to complete one or more questionnaires following Time 1. Of these, only two couples and four individuals contacted the researcher to say they no longer wanted to participate despite repeated attempts to contact them. Reasons for no longer wanting to participate included a change in circumstances, being too busy, poor health, and the personal nature of the questionnaire. All participants who had dropped out after Time 1 were given the opportunity to participate at Time 4. Of those asked, one couple and four individuals completed Time 4. Differences between those who completed all four assessments and those who did not are discussed in the Results section.

As the present study examined the impact of the earthquakes on the intimate relationship and both partners were required to participate at each time point, data from individuals were not included in the analyses. Couples who completed at least Time 1 (N = 100) comprised the study sample (see Data analysis for information on treatment of missing data). Inspection of the raw data revealed that one couple did not complete the questionnaires according to the instructions, so data from this couple was removed. This means that the final sample size was 99 couples.

The sample demographics are summarized in Table 1. The average age for women was 39.98 years (SD = 12.90), and for men it was 42.56 years (SD = 12.76). The sample was predominantly of European decent and educated beyond a high school level with a household

income above NZ$50,000. Although some minority ethnic groups were underrepresented, the sample is comparable to the wider Christchurch/Canterbury population. The sample, however, had a greater household income and had a higher education than the wider Christchurch/Canterbury population (Statistics New Zealand, 2013). All participants were in a married or defacto relationship and had been together for 15 years on average. The majority of the sample had one or more children.

Table 1 *Sample Demographics*

	Women	Men
Age	39.98 (12.90)	42.56 (12.76)
Ethnicity (NZ European)	94 (94.9)	97 (98.0)
Education		
No formal qualification	9 (9.1)	6 (6.1)
Secondary school	19 (19.2)	31 (31.3)
Post-school qualification	71 (71.7)	62 (62.6)
Household Income		
$20,000 or less	5 (5.1)	[a]
$20,000 - $30,000	6 (6.1)	[a]
$30,000 - $50,000	17 (17.2)	[a]
$50,000 - $70,000	25 (25.3)	[a]
$70,000 and $100,000	18 (18.2)	[a]
$100,000 or more	28 (28.3)	[a]
Marital status		
Married/defacto	99 (100)	[a]
Relationship Length	15.11 (12.77)	[a]
Children (Y/N)[c]	77 (77.8)	75 (75.8)

Note: Mean (*SD*) or number of cases (*%*) are presented. *N* = 77 - 99
[a]Scores identical for women and men [b]Items that make up loss of material resources. See measures for further detail [c]Items that make up trauma exposure (number of children was also included as a proxy). See measures for further detail

Procedure. Couples were recruited using a number of different methods. First, flyers about the study were put in letter boxes of residential properties in a number of suburbs in Christchurch. In an attempt to recruit participants who experienced varying degrees of earthquake damage (high, moderate, and low) and who were from different socioeconomic backgrounds (high, moderate, and low) I used the initial 2011 land zoning by the Canterbury Earthquake Recovery Authority (CERA) ("red zone" = land not suitable for rebuild, house to be demolished, "green zone" = home owners can go ahead with repairs or rebuild, "orange

zone" = further assessment needed, "white zone" = awaiting assessment)[1] and an index of socioeconomic neighbourhood deprivation (White, Gunston, Salmond, Atkinson & Crampton, 2008) to select suburbs. As the land zones at the time of recruiting only signified high land damage (the white zone or red zone) or low damage (the green zone), areas with moderate land damage were created using my knowledge and surveying of the green zones. Low damage areas represented those areas that essentially had no land damage and moderate damage areas represented green zones with some land damage.[2] I then selected nine suburbs representing each combination of damage (high, moderate, and low) and neighbourhood deprivation (high, moderate, and low). Second, flyers were circulated in public areas (e.g., libraries, community centres, and coffee shops) and advertisements were made on a local radio station, a local newspaper, and on *Trademe.co.nz* community boards. Finally, individuals who had shown interest (i.e., contacted the researcher) were asked whether they knew anyone who might be interested in participating.

To participate, couples had to be living together since the first earthquake (September 2010), be over 18 years of age, be in a heterosexual relationship [3] and be proficient in the English language. The study was approved by the University Human Ethics Committee (HEC 2011/61, see Appendix 1). One partner of each couple was asked to complete the material loss questionnaire (Time 0). All other questionnaires (Time 1 – Time 4) were completed by both partners. Only one partner completed Time 0 because this questionnaire asked for

[1] CERA categorized Christchurch land into 'land zones' that describe the land (and infrastructure) earthquake damage. The land zones at the time participants were recruited included the red zone, the green zone, and the white zone. The red zone had widespread land and infrastructure damage, which could not be effectively repaired (i.e., the repair would be too costly or disruptive or experts were uncertain how to repair the land). Those in the red zone were told that they had to leave their residential property and were compensated by the government to relocate. The green zone was suitable for residential building. The white zone required further observation and assessment before a decision was reached due to geotechnical issues (i.e., rock fall) (CERA, 2011).

[2] It should be noted that this approach was limited as no validity check was conducted to ensure that the moderate damage areas selected were in fact representative of moderate damage.

[3] The statistical analyses that were to be used at the start of the study assumed that the dyad had a male and female partner as opposed to same-sex partners. Given that I would have had to omit the data for same-sex couples (because there would have not been enough to analyse them separately), I decided that it was unethical to not place restrictions on the sample, including only heterosexual couples.

factual information on loss of material resources (e.g., house damage) that the couple (as opposed to each individual partner) had experienced.

Questionnaires were completed online (via Qualtrics software) and participants were emailed a link to the questionnaire via email. However, to ensure that participants who (a) felt they were not able to use a computer well or (b) did not have access to a computer were not excluded, couples were given the option to complete a pen and paper version (both partners were required to use the same method). Four couples chose the pen and paper method. One couple initially (for Time 0 and Time 1) chose the internet version, but opted for the pen and paper version for the remaining time points (Time 2 – Time 4).

Couples were either emailed the links (a separate link was provided for the male and female partners) or were posted the questionnaires with two pre-paid envelopes (one for each partner) addressed to the researcher. The Time 1 - Time 4 questionnaires were identical for male and female partners. Participants were instructed to complete the questionnaires privately (i.e., not in the company of their partner) and to not discuss the questionnaire until it had been completed and sent to the researcher. Participants also completed a consent form before they completed each questionnaire (see Appendix 2 for an example information sheet, consent form and debriefing sheet). Participants who did not complete the Time 1 questionnaire a month after it was initially sent were sent a reminder email. To minimise attrition, participants who had not completed the Time 2 to Time 4 questionnaires were given two reminders via email at 1 month *and* 2 months following the initial send out date. As a token of appreciation, both partners were given a $10 voucher for every questionnaire completed. In addition, all couples who completed all four questionnaires went into a draw to win a $500 voucher of their choice.

Couples completed the questionnaires over a 15 month period, approximately five months apart. Couples completed the Time 1 questionnaire at 14 months (M = 14.09, SD =

0.32, *M* = 14.21, *SD* = 0.44 for women and men, respectively) following the first (September 2010) earthquake and 8 months following the second earthquake (February 2011) on average. Time 2 was completed on average 18 months (*M* = 18.40, *SD* = 0.70, *M* = 18.50, *SD* = 0.53 for women and men, respectively) post-2010 earthquake and 12 months post-2011 earthquake, and Time 3 was completed on average 23 months (*M* = 23.31, *SD* = 0.54, *M* = 23.38, *SD* = 0.54 for women and men, respectively) post-2010 earthquake and 17 months post-2011 earthquake. Finally, Time 4 was completed on average 29 months (*M* = 29.09, *SD* = 0.29, *M* = 29.21, *SD* = 0.47 for women and men, respectively) post-2010 earthquake and 23 months post-2011 earthquake.

Measures.

Unless indicated otherwise, all measures were completed by both partners. All measures were assessed at all four time points, except for immediate earthquake impact (i.e., loss of material resources and trauma exposure), which was assessed at either Time 0 or Time 1.

Earthquake Stressors. Two categories of more immediate disaster stressors were assessed: loss of material resources (Time 0) and trauma exposure (Time 1) (Norris & Wind, 2009). In addition, ongoing earthquake-related stressors were measured at all four assessment phases to capture the more chronic impact of the earthquakes.

Loss of Material Resources (Time 0). This was adapted from prior scales assessing earthquake impact (e.g., Kuijer et al., 2014), but was designed such that it was specific to loss of material resources. Couples were first asked how many times they have had to move residence for earthquake-related reasons (range 0 – 3). Couples were also asked to rate the overall damage their house had sustained from the earthquakes/aftershocks (*no damage* = 0, *minor damage* = 1, *moderate damage* = 2, or *major damage* = 3). For those couples who had moved more than once since the September 2010 earthquake, the damage sustained to their

current house and the house they were in during the September earthquake was averaged. Participants were also asked whether their current house had a fully functioning sewerage system (*yes* = 0, *no* = 1), current house damage (*none* = 0, *cosmetic damage only* = 1, *structural/more than cosmetic* = 2) whether their house was currently liveable (*yes* = 0, *partly liveable* = 1) and whether they had insurance (*yes* = 1, *no* = 0). Couples were also asked whether or not they or their partner's job changed as a result of the earthquakes. For this measure, we were interested in whether they lost their job for earthquake-related reasons and responses were coded as follows: *no* = 0, yes, *one partner* = 1 and yes, *both partners* = 2. Participants were asked to what extent they experienced financial problems as a result of the earthquakes on a 5 point scale (1 = *not at all*, 2 = *a little bit*, 3 = *moderately*, 4 = *quite a bit*, 5 = *extremely*). To get the item in a checklist format, a score above 2 was coded as 1 and anything equal to or below was coded as 0. Finally, participants were asked whether they had a rental property that sustained damage (*yes* = 1, *no* = 0). Items were summed and the possible range of this measure was 0 – 15.

Trauma Exposure (Time 1). Each partner reported on their trauma exposure at Time 1 (based on Kuijer et al., 2014; Marshall et al., 2014). Participants were asked whether they had feared for their life during the September 2010 earthquake (*yes* = 1, *no* = 0) and the February 2011 earthquake (*yes* = 1, *no* = 0). Participants reported on personal injury (*yes* = 1, *no* = 0)/hospitalization (*yes* = 1, *no* = 0) and family member injuries (*yes* = 1, *no* = 0)/hospitalization (*yes* = 1, *no* = 0) from either earthquakes. They were also asked whether they had lost someone during the February earthquake (loss of someone outside of their immediate circle of family and close friends, such as a friend, neighbour, acquaintance, neighbour, colleague, or other; *yes* = 1, *no* = 0 and loss of someone from their immediate circle of family or close friends as a result of the February 2011 earthquake; *yes* = 2, *no* = 0), and whether they had witnessed someone being injured or killed during the earthquakes (*yes*

= 1, *no* = 0). Finally, three items assessed to what degree they had been worried about the safety of their partner, their family members, and their friends during the February 2011 earthquake, 1 = *not at all worried* (or *not applicable*) and 7 = *extremely worried).* Items were then averaged and the variable was dichotomized, such that 1 – 4 was coded as zero and 5 – 7 as coded to 1. In addition, one item asked about how worried parents had been for their children's safety. However, because nearly all parents had been very worried (*M* = 6.65, *SD* = 1.42 for women and *M* = 6.54, *SD* = 1.59 for men), an item indicating whether or not participants had children was included as a proxy (*yes* = 1, *no* = 0). Items were summed and the possible range of this measure was 0 – 11.

Ongoing Earthquake Stressors (Time 1 – Time 4). To assess ongoing earthquake impact, an earthquake-related stressors measure adapted from Kuijer et al. (2014; see also Marshall et al., 2014) was used at all four time points. The scale is modelled after the Hassles Scale (Kanner, Coyne, Schaefer, & Lazarus, 1981) and includes 38 items, which were developed using information from the local media, the investigator's knowledge of earthquakes, and prior participant comments (e.g., "living in a damaged house"). Participants could add three further hassles, bringing the total to 41 hassles. Participants were asked whether or not they were experiencing the hassle (*yes*/*no*). If they were experiencing the hassle, they were asked to indicated how stressful it has been for them (1 = *somewhat stressful*, 3 = *extremely stressful*; see Appendix 3 for full questionnaire). Because ratings of severity correlated highly with the frequency of hassles (Kanner et al., 1981; Kuijer et al., 2014), the frequency of the hassles experienced was used in the current study.

Posttraumatic Stress Symptoms (Time 1 – Time 4). Posttraumatic stress symptoms were assessed at all four time points using the IES-R (Weiss & Marmar, 1997), which has good reliability (Creamer et al., 2003; Weiss & Marmar, 1997) and validity (e.g., Beck et al., 2008; Creamer et al., 2003; Sveen et al., 2010). This 22 item scale assesses the three

symptom clusters characteristic of posttraumatic stress disorder (PTSD): intrusions (eight items, e.g. "any reminder bought back feelings about it), hyperarousal (six items, e.g. "I was jumpy and easily startled"), and avoidance (eight items, e.g. "I stayed away from reminders about it") (see APA, 2000; 2013). Each partner was asked to what extent s/he had been experiencing the symptom in the past seven days in relation to the traumatic event (0 = *not at all*, 4 = *extremely;* see Appendix 3 for full questionnaire). The subscales correlated highly with one another (ranging from .54, p <.0001, between women's scores of intrusion and avoidance symptoms at Time 4 to .86, p <.0001, between women's scores of hyperarousal and intrusion symptoms at Time 1). Thus, a total score was used. A total average score of 1.5 is recommended as a cut-off when screening for PTSD (Creamer et al., 2003). Alpha coefficients ranged from .93 to .95 for women and .94 to .95 for men.

Relationship Quality (Time 1 – Time 4). Relationship quality was measured using the six-item short-form version of the reliable and valid PRQC (Fletcher et al., 2000). The short form version includes 1 item to assess relationship satisfaction, commitment, intimacy, trust, passion, and love (e.g. "how satisfied are you with your relationship?", "how committed are you to your relationship?") and each partner was asked to indicate what his/her current partner/relationship is like on a 7-point Likert scale (1 = *not at all*, 7 = *extremely;* see Appendix 3 for full questionnaire). Items were summed together forming a total relationship quality score. Alpha coefficients ranged from .80 to .86 for women and .78 to .89 for men.

Data analysis.

The data was structured for analyses using the APIM (Kenny et al., 2006; Kenny, 1996). As already mentioned in Chapter 1, the APIM model enables one to test within-person effects (or actor effects), whereby one person's score on a predictor variable affects his/her score on an outcome variable, in addition to between-person effects (or partner effects), whereby a person's score on a predictor variable affects his/her partner's score on an outcome

variable. For example, APIM enables us to test how a person's trauma exposure predicts his/her relationship quality (actor effects; see path A in Figure 3, p. 13) and how the partner's trauma exposure predicts his/her relationship quality (partner effects; see path B in Figure 3, p.13). Moreover, by including both actor and partner effects in a model, any variance they share is controlled for.

Dyadic growth curve models (which estimate the intercept and slope across time of the outcome variable) and moderated dyadic growth curve models (which also examine potential moderators of the intercept and slope of the outcome variable) were conducted using multilevel modelling (Kashy & Donnellan, 2008) in IBM SPSS v 20. These analyses use all available data for dyads (including those dyads that did not complete all study phases). Although, missing data is dealt with via Listwise deletion in SPSS, the structure of a dyadic multilevel model means that estimates are based on each dyad's contribution, such that the overall fixed effects are weighted according to the number of time points the dyad has completed (i.e., the dyad with missing data is still in the analyses but just with fewer observations). By using all available data for data analysis (instead of using data from couples who completed all time points only), potential non-response bias is addressed (e.g., study completers and dropouts may differ from each other on study variables and demographics, see the results section) and statistical power is maximised. Dyadic interdependence is modelled by estimating (a) the correlation between partners' intercepts, (b) the correlation between partners' slopes, and (c) the correlation between partners' time-specific residuals (see Kashy & Donnellan, 2008 for more detail). All models were estimated using Full Maximum Likelihood (referred to as ML in SPSS) as this allows for chi-square difference tests (or deviance tests) to be conducted comparing nested models (see Singer & Willett, 2003 for more detail; see below for details on how these were used on the current study). Time was centred to the time since the first assessment (Time 1) so that time-zero

refers to Time 1. As not all participants completed the questionnaires at the same time (*SDs* ranged from .32 months for women at Time 1 to .70 for women at Time 2), the variable was computed relative to when each participant actually completed the questionnaire. Thus, Time 1 reflects the average time that Time 1 was completed. Sex was coded -1 for women and 1 for men. All continuous predictors were centred on the grand mean (Aiken & West, 1991).

Following Singer and Willet (2003), I began by modelling the dyadic interdependence of the data (including random effects and no fixed effects). As mentioned above, dyadic interdependence is modelled by estimating the correlation between partners' intercepts, slopes, and time-specific residuals (Kashy & Donnellan, 2008). To do this, I ran three models, each building on the previous model (all models used dummy codes given to men and women). I modelled the random effects in this way to determine the best fitting model (i.e., the most parsimonious model that fitted the features of the data best using fit statistics discussed in further detail below). Furthermore, this approach enables the researcher to detect and avoid potential issues (i.e., convergence issues due to very small variances and covariances) when modelling both random and fixed effects. Model 1 included the correlation between partners' time-specific residuals (or unexplained variance). Model 2 included the effects in Model 1, but also included the variances and covariances of partners' intercepts. Model 3 included the effects in the two prior models, but also included the variances and covariances of partners' slopes. Chi-square difference tests were conducted to determine the best fitting model. Once the best fitting random structure was established, I ran two unconditional models, one examining the linear fixed effects of time and the other the quadratic effects. Again, a chi-square difference test was conducted to determine the best fitting model. Finally, a conditional base model was conducted that examined potential sex differences (as a main effect and an interaction with time).

To determine the separate effects of the possible predictors (loss of material resources, trauma exposure, ongoing earthquake stressors, and posttraumatic stress symptoms), a model was run for each predictor variable. The model built on the best-fitting baseline conditional growth model and first included the main effects for actor predictor values and the higher-order interactions with time and sex, culminating in a 3-way interaction between the actor predictor, time, and sex. Following this, partner predictor values were added along with their interactions with sex or time, culminating in two 3-way interactions between the actor/partner predictor, time, and sex (excluding loss of material resources, where actor and partner scores were identical). Chi-square difference tests were conducted as described above, and I also investigated whether the Akaike information criteria (AIC; which accounts for the parameters in the model) and more importantly the Bayesian information criteria (BIC; which also considers the sample size) had decreased. As suggested by Raftery (1995), a six to ten point difference between the models was considered strong evidence that the new model was a better fit, and a greater than ten point difference was considered very strong evidence. The fit statistics described above were examined to determine whether adding the partner variables improved model fit. Following this, the interaction between actor and partner variables and their higher-order interactions were added, culminating in one possible 4-way interaction between actor scores, partner scores, time, and sex (excluding loss of material resources, which had one possible 3-way interaction between the predictor, sex, and time). Again, fit statistics were examined to determine whether the model fit improved. A final model including all the significant effects was run to determine how effects were sustained when others were controlled for. All significant interactions are graphed using 1 *SD* above and 1 *SD* below the grand mean as high and low values for each continuous predictor (Aiken & West, 1991). Time was graphed in months using 0 to 15 for the low and high values, respectively, and sex was -1 (women) and 1 (men).

Results

Preliminary Analyses.

Dropout Analyses. Independent-samples *t*-tests were conducted to determine how those individual partners (as opposed to couples) who dropped out (i.e., did not complete all four time points[4]) differed from those who completed the study (i.e., completed all four time points). Men and women were examined separately in these analyses (refer to Table 2 for the results). First, I investigated whether participants who did not complete Time 1 but expressed interest in the study by completing (or having their partner complete) Time 0 differed on average from those who did complete Time 1. As shown in Table 2, neither male nor female Time 1 completers differed from Time 1 dropouts. Second, I investigated whether participants who did not complete one or more follow-up questionnaires differed from those who completed all follow-up questionnaires. Women who did not complete all Time 1 to Time 4 questionnaires had significantly lower relationship quality, higher trauma exposure, were younger, and had been in their current relationship for fewer years. Men had significantly higher trauma exposure, higher posttraumatic stress symptoms, had less education, and had been in their current relationship for fewer years (see Table 2).

Descriptive Analyses. Table 3 (see p. 46) presents the descriptive statistics variables at each time point of the study, and Table 4 (see p. 46) presents correlations between the Time 0 (loss of material resources) and Time 1 variables (refer to Appendix 5 for correlation matrices for Time 2 – Time 4). As demonstrated in Table 3, relationship quality in the current sample was high on average across all four time points. Posttraumatic stress symptoms, ongoing earthquake-related stressors, trauma exposure, and loss of material resources were relatively low on average. Posttraumatic stress symptoms and ongoing earthquake-related stressors decreased over the four time points. As expected, non-

[4] Both partners of the couple that were excluded from the analyses following an investigation of their raw data were included as "dropouts" in the attrition analyses.

independence between dyad members was found (see the bivariate correlations in Table 3). Relationship quality, trauma exposure, and ongoing earthquake stressors were all significantly correlated between partners. In contrast, posttraumatic stress scores were significantly correlated between partners at Time 3 only. Controlling for the interdependence in relationship quality is discussed below. Dependent *t*-tests were also conducted to test for differences between men and women on the study variables. As shown in Table 3, women had significantly higher posttraumatic stress symptoms than men.

Table 2 *Differences between Time 1 Completers and Time 1 and Time 2-Time 4 Dropouts on Relevant Study Variables Measured at Time 0 or 1*

	Women					Men				
	Completers		Dropouts			Completers		Dropouts		
Variable	*M*	*SD*	*M*	*SD*	*t*	*M*	*SD*	*M*	*SD*	*t*
Time 1 completers vs. Time 1 Dropouts										
Loss of Material Resources	4.34	1.56	4.33	1.96	-0.02	4.28	1.54	4.57	1.95	0.83
Time 1 – Time 4 completers vs. Time 2 – Time 4 Dropouts										
Age	41.93	13.66	35.20	9.45	-2.25*	43.85	13.35	39.52	10.90	-1.37
Level of education[d]	2.63	0.66	2.61	0.63	-0.18	2.66	0.53	2.32	0.72	-2.26*
Household income[e]	4.31	1.39	4.29	1.63	-0.07	4.34	1.33	4.56	1.31	0.75
Relationship length (years)	16.77	13.32	10.96	10.36	-2.30*	17.30	13.77	10.61	10.01	-2.62*
Loss of Material Resources	4.36	1.57	4.07	1.41	-0.82	[a]	[a]	[a]	[a]	[a]
Trauma Exposure	3.30	1.80	4.48	2.29	2.66*	3.24	1.99	4.25	1.80	2.31*
Ongoing EQ[b] Stressors	14.19	7.39	16.11	8.54	1.13	14.23	6.84	14.18	7.80	0.03
PTSS[c]	0.98	0.85	0.67	0.62	1.72	0.42	0.48	0.74	0.75	2.12*
Relationship Quality	38.94	2.96	36.37	5.15	-2.17*	37.80	4.83	37.21	6.05	-0.51

Note: For Time 1 completers $n = 105$ for women and 98 for men and for Time 1 dropouts $n = 21$ for women and 98 for men.
For Time 1 – Time 4 completers $n = 61 – 71$ for women and 62 – 71 for men. For Time 2 – Time 4 dropouts $n = 25 – 28$ for women and $n = 23 – 28$ for men.
[a]Scores identical for women and men [b]EQ = earthquake [c]PTSS = posttraumatic stress symptoms [d] Level of education: 1 = *left without school certificate*, 2 = *High school qualification*, 3 = *Tertiary qualification*. [e]Household income ranging from 1 = *$20,00 or less* to 6 = *$100,000+* * $p < .05$. ** $p < .01$. *** $p < .001$

Table 3 *Means, Standard Deviations, Correlations, and Dependent T-Tests for the Earthquake Stress Variables and Relationship Quality.*

	Men	Women		
Variable	*M/n* (*SD/%*)	*M/n* (*SD/%*)	*r*	*t*
Relationship Quality				
14 months post 2010 EQ	37.64 (5.18)	38.32 (3.81)	.45***	1.40
18 months post 2010 EQ	37.51 (4.15)	37.81 (4.37)	.53***	0.42
23 months post 2010 EQ	37.76 (3.74)	37.27 (4.55)	.57***	-1.16
29 months post 2010 EQ	37.18 (4.58)	37.60 (4.00)	.44***	0.93
Posttraumatic Stress Symptoms				
14 months post 2010 EQ *M*	0.51 (0.59)	0.76 (0.70)	.16	2.85**
14 months post 2010 EQ ≥ cut-off	8 (8.1)	17 (17.5)		
18 months post 2010 EQ *M*	0.40 (0.46)	0.69 (0.68)	.07	3.10**
18 months post 2010 EQ ≥ cut-off	3 (3.7)	10 (11.5)		
23 months post 2010 EQ *M*	0.37 (0.46)	0.56 (0.57)	.23*	2.55*
23 months post 2010 EQ ≥ cut-off	3 (3.8)	8 (10.1)		
29 months post 2010 EQ *M*	0.32 (0.50)	0.48 (0.53)	.22	2.12*
29 months post 2010 EQ ≥ cut-off	3 (4.0)	5 (6.4)		
Ongoing EQ stressors				
14 months post 2010 EQ	14.21 (7.08)	14.67 (7.75)	.31**	0.54
18 months post 2010 EQ	10.80 (6.05)	11.97 (6.52)	.36**	1.00
23 months post 2010 EQ	9.97 (6.64)	10.23 (6.16)	.38**	0.27
29 months post 2010 EQ	9.29 (6.50)	9.55 (5.34)	.41***	0.34
Loss of Material Resources[a]	4.28 (1.53)	[a]	[a]	
Trauma Exposure[a]	3.15 (1.41)	2.92 (1.54)	.42***	1.98

[a] Scores identical for women and men

Note. Pearson's *r* indicates the correlations between variables collected from partners (e.g., the correlation between the female partner's and male partner's perceived relationship quality). [a]Refer to Appendix 4, Table 13, which breaks down the frequencies (or *M, SD*) of each item included in the scale.

* $p < .05$. ** $p < .01$. *** $p < .001$.

Table 4 *Correlations for Variables at Time 0 & 1 for Men and Women.*

Variable	1	2	3	4	5
1. Relationship Quality	—	-.27**	-.22*	.10	-.23*
2. Posttraumatic Stress Symptoms	-.31**	—	.59***	.14	.36***
3. Ongoing EQ stressors	-.34**	.45***	—	.35***	.18
4. Loss of Material Resources	.01	.16	.36***	—	-.03
5. Trauma Exposure	-.02	.35***	.21*	.18	—

Note. Correlations among the variables for men appear below the diagonal; those for women appear above the diagonal.

** $p < .01$. *** $p < .001$.

Base Models.

Modelling Dyadic Interdependence. The dyadic interdependence of the data was modelled first, in three separate models, each building on the previous ones. The first model included the time-specific residuals between spouses. The second model also included the variance and covariance of the partners' intercepts, and the third model also included the variance and covariance of the partners' slopes. In this final model, the residuals (unexplained variance) significantly varied across men, Var = 6.06, *SE* = 0.72, Wald Z = 8.40, $p < .0001$ 95% CI [4.80, 7.65] and women, Var = 5.85, *SE* = 0.63, Wald Z = 9.30, $p < .0001$, 95% CI [4.74, 7.22] and the residuals between partners' were significantly positively correlated, $r = .23$, *SE* = .07, Wald Z = 3.05, $p < .01$, 95% CI [0.08, 0.37]. There was also significant variability in relationship quality amongst men, Var = 15.83, *SE* = 2.74, Wald Z = 5.77, $p < .0001$, 95% CI [11.27, 22.23], and women, Var = 11.46, *SE* = 2.02, Wald Z = 5.67, $p < .0001$, 95% CI [8.11, 16.20], at the beginning of the study (i.e., variability around the intercept). Furthermore, there was a significant positive association between both partners' relationship quality at the beginning of the study, $r = .58$, Wald Z = 4.16, $p < .0001$, 95% CI [4.11, 11.41]. There was, however, no significant variability in the slope of relationship quality amongst men, Var = 0.00, *SE* = 0.01, Wald Z = .43, $p = .67$, 95% CI [0.00, 0.39], and women, Var = 0.01, *SE* = .01, Wald Z = 1.45, $p = .15$, 95% CI [0.00, 0.05]. In addition, partners' slopes across time were not significantly related, $r = .37$, Wald Z = 0.41, $p = .69$, 95% CI [-0.01, 0.02]. The chi-square difference test revealed that the addition of variances and covariances of partners' intercepts significantly improved the model, $x^2(3) = 279.28$, $p < .0001$, but the addition of variances and covariances of partners' slopes did not, $x^2(3) = 2.83$, $p = .43$. As the slopes did not differ between and within couples and the chi-square difference test between this model and the prior model was not significant, the variances and covariances of partners' slopes were removed from the model for the remainder of the analyses.

Unconditional Models. The fixed effect of time (linear effect) was first examined. On average, relationship quality significantly decreased over the study period, b = -.05, *SE* = .02, *t*(251) = -2.46, *p* = .01, 95% CI [-0.09, -0.01]. I also modelled a quadratic fixed effect of time, which was not significant (linear term b = -0.12, *SE* = .07, *t*(255) = -1.74. *p* = .08, 95% CI [-0.24, 0.02]; quadratic term b = 0.00, *SE* = 0.00, *t*(252) = 1.06, *p* = .29, 95% CI [-0.00, 0.01]). Furthermore, the addition of the quadratic effect of time did not significantly improve model fit, $x^2(1) = 1.11$, *p* = .30. Given this fact, and because I did not have any theoretical reason to expect a quadratic effect of time, subsequent models include the linear effects of time only.

Conditional Base Model. In the conditional base model I investigated possible sex differences by including sex and its higher-order interaction with time as fixed effects. The fixed effect for linear time remained significant, b = -0.05, *SE* = .02, *t*(251) = -2.46, *p* = .02, 95% CI [-0.09, -0.01]. Neither the intercept, b = -.23, *SE* = .22, *t*(130) = -1.04, *p* = .30, 95% CI [-0.66, 0.20], nor the slope of relationship quality, b = 0.02, *SE* = .02, *t*(241) = 1.10, *p* = .27, 95% CI [-0.01, 0.05], differed significantly between men and women. This model did not demonstrate a significantly better fit than did the linear unconditional model, $x^2(2) = 1.59$, *p* = .45. However, the sex difference conditional model was kept as the base model so that higher-order sex interactions with earthquake stressor/stress variables could be examined.

Earthquake-Related Stressor/Stress Models. A model was then run for each earthquake-related stressor variable (loss of resources, trauma exposure, ongoing earthquake-related stressors) and the stress variable (posttraumatic stress symptoms). For each model (excluding loss of material resources), the actor effects (including the higher-order interactions with sex and time) were added first, followed by the partner effects and finally the actor by partner interactions. As loss of material resources was identical for both partners, this model examined actor effects only. The fit statistics were then compared to determine whether the model fit improved when partner and then actor by partner effects were added. For all models (the trauma exposure model, the

ongoing earthquake-related hassles model, and the posttraumatic stress symptom model), the fit statistics demonstrated that although the addition of the partner variables and their interactions significantly improved the model fit, the addition of actor by partner interactions did not. In all models, the main effect for time remained a significant predictor of relationship quality (for the loss of resources model: b = -.05, *SE* = .02, *t*(242) = -2.31, p = .02, 95% CI [-0.09, -0.01]. See Tables 5 to 7 for remaining models). Furthermore, the main effect for sex and its interaction with time also remained non-significant in each model. The findings for each model that are relevant to the hypotheses are expanded upon below.

Loss of Material Resources Model. This model examined the effect of individuals' loss of resources on their relationship quality. The main effect for loss of material resources was neither significantly related to relationship quality at the beginning of the study, b = 0.29, *SE* = .24, *t*(113) = 1.18, *p* = .24, 95% CI [-0.20, 0.77], nor over time, b = -0.01, *SE* = 0.01, *t*(242) = -0.56, *p* = .58, 95% CI [-0.03, 0.02]. These effects were also not moderated by sex or time (loss of material resources by sex, b = -0.09, *SE* = .14, *t*(121) = -0.62, *p* = .54, 95% CI [-0.37, 0.19]; loss of material resources by sex by time, b = -0.01, *SE* = .01, *t*(230) = -0.75, *p* = .45, 95% CI [-0.03, 0.01]).

Trauma Exposure Model. The results for the trauma exposure model are reported in Table 5. No actor effects were significant. Of the partner effects, a significant two-way interaction was found between partner-reported trauma exposure and time. As shown in Figure 4 (p. 53), individuals with partners reporting low trauma exposure had higher relationship quality at Time 1 compared to individuals with partners reporting high trauma exposure. However, their levels were comparable at the end of the study as the relationship quality of individuals with partners reporting low trauma exposure decreased significantly over the study period, *b* = -0.09, *SE* = 0.03, *t* = -2.94, *p* = .004, whereas the slope remained stable over time for individuals with partners reporting a higher number of earthquake stressors, *b* = 0.00, *SE* = 0.03, *t* = 0.02, *p* = .99

Table 5 *Relationship Quality as a Function of Actors' and Partners' Trauma Exposure*

Fixed effects	Step 1				Step 2				Step 3			
	Actor				Partner				Actor × Partner			
	b	*SE*	95% CI	*t*(*df*)	b	SE	95% CI	*t*(*df*)	b	SE	95% CI	*t*(*df*)
Intercept	37.55***	0.44	[36.67, 38.43]	84.75(96)								
Sex	-0.33	0.22	[-0.84, 1.67]	-1.32(108)								
Time	-0.04*	0.02	[-0.09, -0.00]	-1.97(211)								
Sex × Time	0.02	0.02	[-0.02, 0.06]	1.07(202)								
Trauma Exposure	-0.26	0.24	[-0.72, 0.21]	-1.09(199)	-0.33	0.24	[-0.81, 0.14]	-1.38(180)	0.06	0.18	[-0.30,0.41]	0.32(98)
Sex × Trauma Exposure	0.10	0.29	[-0.47, 0.67]	0.35(126)	0.18	0.29	[-0.40, 0.76]	0.61(123)	-0.02	0.10	[-0.22, 0.19]	-0.18(106)
Time × Trauma Exposure	0.02	0.14	[-0.01, 0.05]	1.31(373)	0.03*	0.01	[0.00, 0.06]	2.13(375)	0.00	0.01	[-0.02,0.02]	0.21(209)
Sex × Time × Trauma Exposure	-0.01	0.16	[-0.04, 0.67]	-0.84(314)	0.01	0.02	[-0.02, 0.04]	0.49(315)	0.00	0.01	[-0.14, 0.02]	0.11(202)
Deviance (ΔD)	3207.82				2961.64 (246.18***)				2961.37 (0.27)			
AIC	3235.82				2997.64				3005.37			
BIC	3297.72				3075.73				3100.82			

Note. This table reports the fixed effects (b, *SE*, 95% CI, *t*, *df*) from the final model. Fit statistics enabling comparison across models are also presented. For sex, 1 = men, -1 = women.
* $p < .05$. ** $p < .01$. *** $p < .001$.

Table 6 *Relationship Quality as a Function of Actors' and Partners' Ongoing Earthquake-Related Stressors*

Fixed effects	Step 1				Step 2				Step 3			
	Actor				Partner				Actor × Partner			
	b	*SE*	95% CI	*t*(*df*)	b	SE	95% CI	*t*(*df*)	b	SE	95% CI	*t*(*df*)
Intercept	38.02***	0.38	[37.27, 38.77]	99.68(126)								
Sex	-0.22	0.23	[-0.68, 0.24]	-0.94(132)								
Time	-0.06*	0.02	[-0.11, -0.01]	-2.55(259)								
Sex × Time	0.02	0.02	[-0.02, 0.06]	1.08(258)								
O. EQ stressors	-0.01	0.03	[-0.07, 0.05]	-0.46(605)	-0.07*	0.03	[-0.13, -0.01]	-2.30(608)	-0.00	0.00	[-0.01, 0.00]	-0.78(310)
Sex × O. EQ stressors	-0.04	0.03	[-0.10, 0.03]	-1.16(495)	0.00	0.03	[-0.06, 0.07]	0.08(497)	0.00	0.00	[-0.00, 0.01]	1.11(324)
Time × O. EQ stressors	0.00	0.00	[-0.00, 0.01]	0.57(490)	0.01[a]	0.00	[-0.00, 0.01]	1.82(483)	0.00	0.00	[-0.00, 0.00]	0.27(261)
Sex × Time × O. EQ stressors	0.01**	0.00	[0.00, 0.02]	2.92(390)	-0.00	0.00	[-0.01, 0.00]	-0.78(310)	0.00	0.00	[-0.00, 0.00]	0.41(268)
Deviance (ΔD)	3504.90				3430.55 (74.35***)				3427.07 (3.48)			
AIC	3532.90				3466.55				3471.07			
BIC	3596.09				3547.41				3569.90			

Note. This table reports the fixed effects (b, *SE*, 95% CI, *t*, *df*) from the final model. Fit statistics enabling comparison across models are also presented. For sex, 1 = men, -1 = women. [a]This interaction is significant ($p = .03$) when actor by partner effects are not included. O. EQ stressors = Ongoing Earthquake Stressors.
* $p < .05$. ** $p < .01$. *** $p < .001$.

Table 7 *Relationship Quality as a Function of Actors' and Partners' Posttraumatic Stress Symptoms*

Fixed effects	Step 1				Step 2				Step 3			
	Actor				Partner				Actor × Partner			
	b	*SE*	95% CI	*t*(*df*)	b	SE	95% CI	*t*(*df*)	b	SE	95% CI	*t*(*df*)
Intercept	38.00***	0.37	[37.27, 38.73]	103.29(123)								
Sex	-0.18	0.23	[-0.64, 0.27]	-0.81(129)								
Time	-0.05*	0.02	[-0.09, -0.01]	-2.41(239)								
Sex × Time	0.01	0.02	[-0.02, 0.05]	0.82(233)								
PTSS	-0.95**	0.36	[-1.66, -0.24]	-2.64(551)	-1.10**	0.36	[-1.80, -0.39]	-3.07(578)	0.03	0.60	[-1.16, 1.24]	0.05(325)
Sex × PTSS	-0.35	0.37	[-1.01, 0.38]	-0.93(507)	-0.28	0.37	[-1.00, 0.44]	-0.75(530)	0.39	0.43	[-0.45, 1.24]	0.91(318)
Time × PTSS	0.00	0.03	[-0.06, 0.07]	0.09(481)	0.14***	0.03	[0.10, 0.20]	3.99(486)	0.04	0.07	[-0.10, 0.17]	0.54(305)
Sex × Time × PTSS	0.12**	0.04	[0.05, 0.19]	3.25(424)	-0.01	0.04	[-0.08, 0.06]	-0.23(429)	-0.03	0.05	[-0.13, 0.07]	-0.56(308)
Deviance	3476.43				3362.68				3361.24			
(ΔD)					(113.75***)				(1.44)			
AIC	3504.43				3398.68				3405.24			
BIC	3567.53				3479.32				3503.80			

Note. This table reports the fixed effects (b, *SE*, 95% CI, *t*, *df*) from the final model. Fit statistics enabling comparison across models are also presented. For sex, 1 = men, -1 = women. PTSS = Posttraumatic Stress Symptoms

* $p < .05$. ** $p < .01$. *** $p < .001$

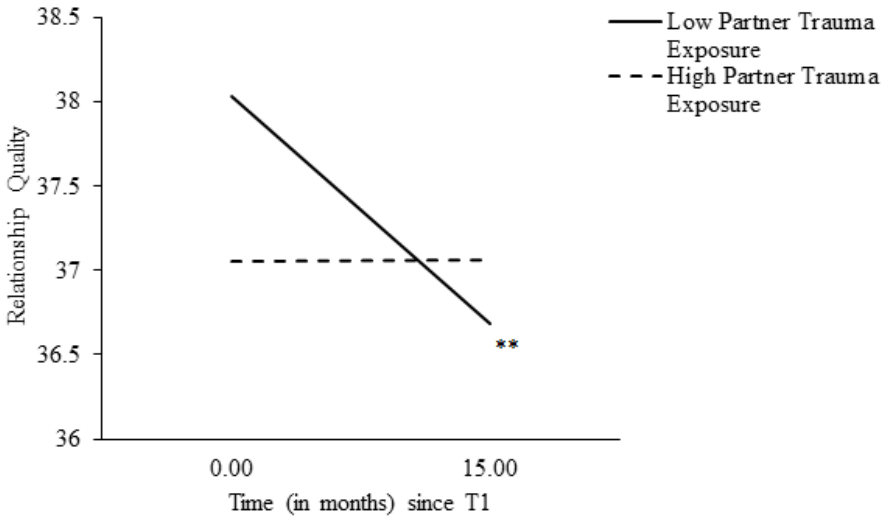

Figure 4 *Linear changes in relationship quality predicted by time (in months) since Time 1, as moderated by partners' reported trauma exposure*

Ongoing Earthquake Related Stressors Model. This model investigated the effect of actor and partner ongoing earthquake-related stressors on relationship quality (refer to Table 6, p.51). Of the actor effects, a significant 3-way interaction was found between time, sex, and actor-reported earthquake-related stressors. As shown in Figure 5, when experiencing a lower number of earthquake related stressors across all four time points, women and men had comparable relationship quality at Time 1. However, men's relationship quality significantly decreased over the study period, b = -0.12, SE = 0.04, t = -2.81, p = .01, whereas women's remained relatively stable, b = -0.02, SE = 0.04, t = -0.61, p = .55. When experiencing a higher number of earthquake-related stressors at all four time points, men had slightly lower relationship quality at Time 1 than women. However, women's relationship quality significantly declined over time, b = -0.13, SE = 0.05, t = -2.88, p = .01, whereas men's remained stable, b = 0.04, SE = 0.04, t = 0.92, p = .36.

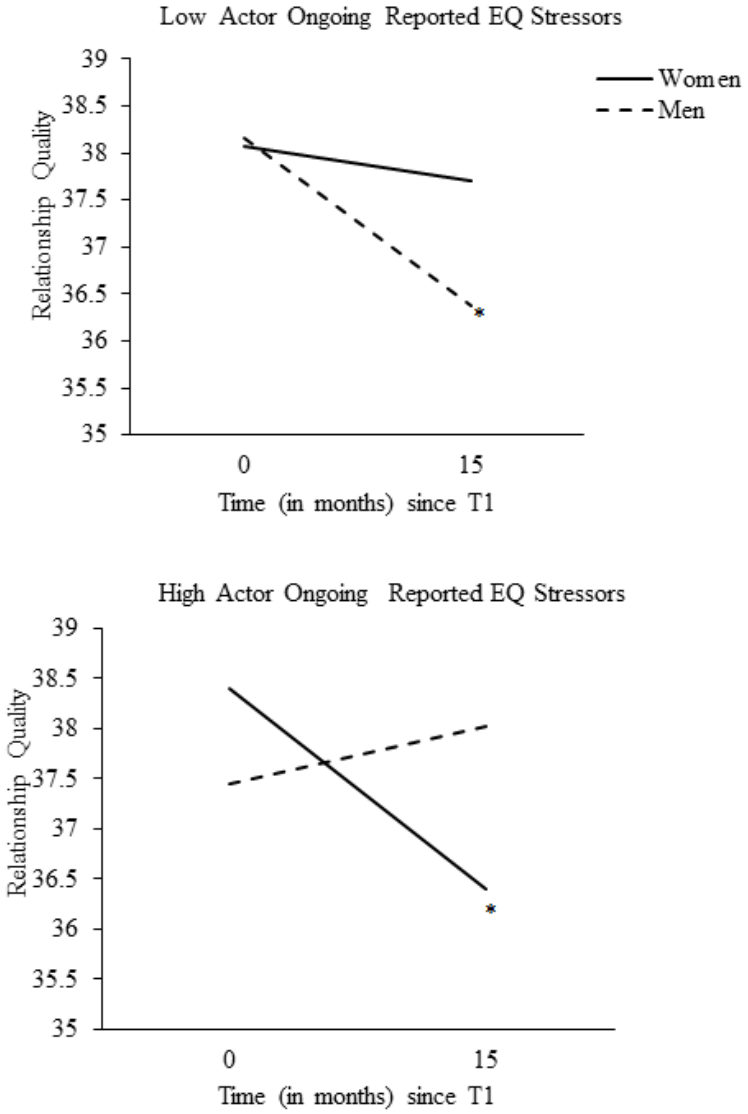

Figure 5 *Linear changes in relationship quality predicted by time (in months) since Time 1, as moderated by actors' reported ongoing earthquake-related stressors and sex*

Of the partner effects examined, a significant main effect for partner reported earthquake-related stressors emerged. When individuals' partners reported experiencing a higher number of earthquake-related stressors their relationship quality was significantly lower at Time 1 than if their partners reported experiencing a lower number. It is also notable that when actor and partner effects were included (in Step 2), this main effect was qualified within a significant 2-way interaction with time. At Time 1, individuals with partners reporting a higher number of earthquake-related stressors at all four time points had lower relationship quality

than those with partners reporting a lower number. However, their levels were comparable at the end of the study as the relationship quality of individuals with partners reporting a lower number of earthquake stressors decreased significantly over the study period, b = -0.10, SE = 0.03, t = -3.21, p = .002, whereas the slope remained stable over time for individuals with partners reporting a higher number of earthquake stressors at all four time points remained stable, b = -0.02, SE = 0.03, t = -0.66, p = .51. However, this effect was no longer significant when actor by partner effects were included. No actor by partner interactions were significant.

Posttraumatic Stress Symptoms Model. This model investigated the effect of actor and partner posttraumatic stress symptoms on relationship quality (refer to Table 7, p. 52). Of the actor effects, a significant main effect for actor posttraumatic stress symptoms was found, which was qualified within a significant 3-way interaction between time, sex, and actor posttraumatic stress symptoms. As shown in Figure 6, when experiencing low posttraumatic stress at all four time points, women and men had comparable relationship quality at Time 1. However, men's relationship quality significantly decreased over the study period, b = -0.11, SE = 0.03, t = -3.20, p = .002, whereas women's remained stable, b = 0.00, SE = 0.04, t = 0.04, p = .97. When experiencing higher posttraumatic stress symptoms at all four time points, men had slightly lower relationship quality at Time 1 than women. However, women's relationship quality significantly declined over time, b = -0.13, SE = 0.04, t = -3.58, p < .001, whereas men's remained stable, b = 0.03, SE = 0.05, t = 0.70, p = .49.

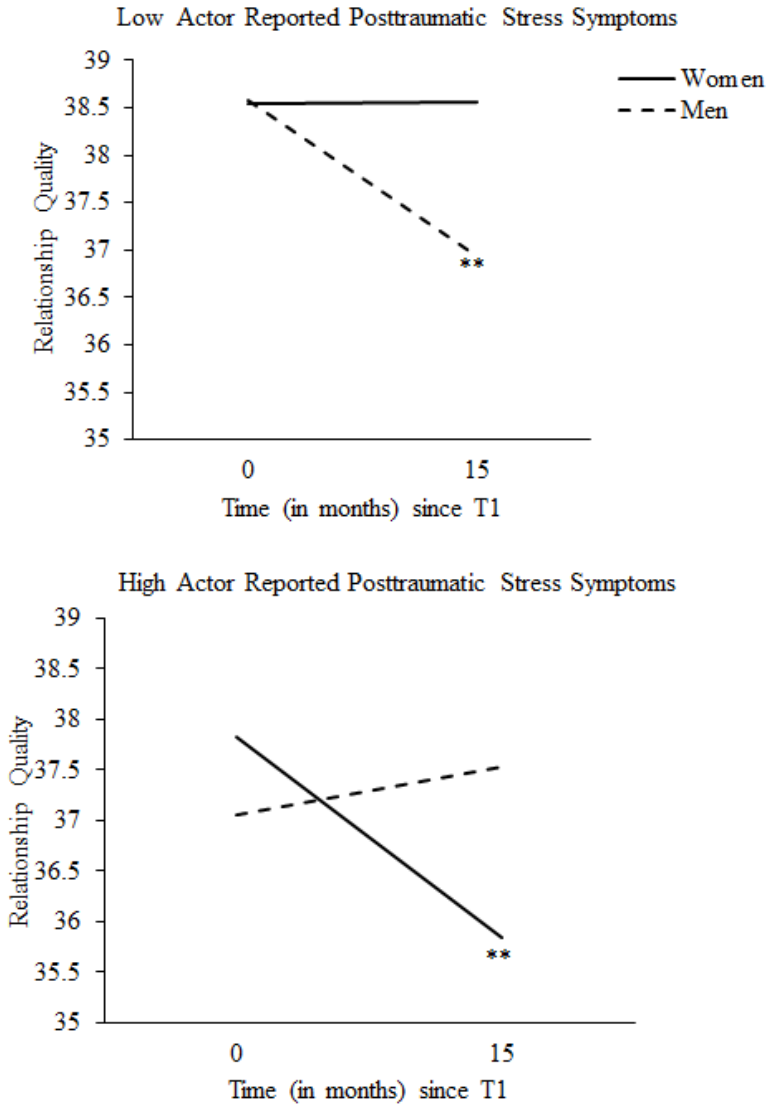

Figure 6 *Linear changes in relationship quality predicted by time (in months) since Time 1, as moderated by actors' reported posttraumatic stress and sex*

Of the partner effects tested, a significant main effect was also found for partner posttraumatic stress symptoms, which was qualified by a 2-way interaction with time (see Figure 7). At Time 1, individuals with partners experiencing higher posttraumatic stress symptoms across all four time points had lower relationship quality than those with partners experiencing lower posttraumatic stress symptoms. However, levels were comparable at the end of the study period as the relationship quality of individuals with partners experiencing low posttraumatic stress symptoms decreased significantly, b = -0.13, SE = 0.03, t = -4.48, p <

.0001, whereas the slope remained stable over time for individuals with partners experiencing higher posttraumatic stress symptoms, $b = 0.03$, $SE = 0.03$, $t = 0.93$, $p = .35$. No actor by partner effects were significant.

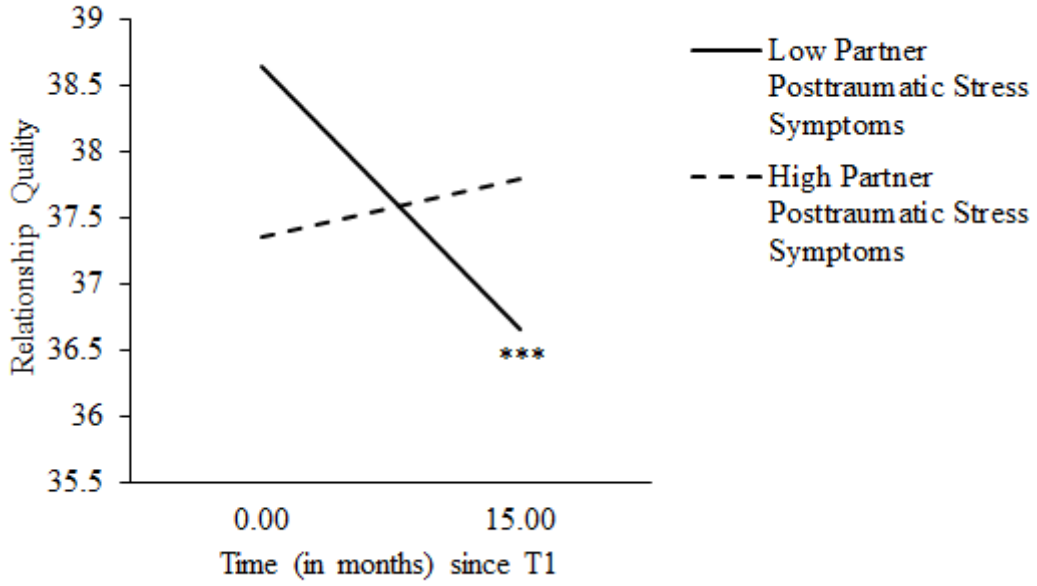

Figure 7 *Linear changes in relationship quality predicted by time (in months) since Time 1, as moderated by partners' reported posttraumatic stress*

Final Earthquake Stress Model. A final model was composed, which included all the significant effects (and the terms leading to these effects) found in the earthquake stress models run earlier (the partner earthquake hassles by time interaction, which was significant in the actor and partner model, but not when the actor by partner model was also included). All actor and partner main effects for each of the predictor variables were included, even if they were not significant in the prior models. This ensured that any variance they shared was controlled for. In this model, the main effects for actor posttraumatic stress symptoms and partner posttraumatic stress symptoms remained significant along with the significant posttraumatic stress interactions (sex by time by actor posttraumatic stress symptoms and partner posttraumatic stress symptoms by time). The main effect for time, however, was no longer significant ($p = .12$) along with all the significant effects found previously for ongoing

earthquake-related stressors (partner ongoing earthquake hassles, p =.25; sex by time by actor ongoing earthquake hassles, p =.89). The time by partner trauma exposure interaction found previously was also not significant in this final model, p =.08. Thus the earthquake-related stress variable (posttraumatic stress symptoms) is the strongest predictor of relationship quality postearthquake.

Discussion

Addressing the limitations of prior research, this four-wave study of couples investigated how stressors related to the Canterbury earthquakes (loss of material resources, trauma exposure, and ongoing earthquake-related stressors) and the experience of earthquake-related stress (posttraumatic stress symptoms) affected relationship quality by taking a dyadic and developmental perspective. Overall, the results suggest that high earthquake-related stressors (in particular ongoing earthquake-related stressors) and the experience of earthquake-related stress (i.e., posttraumatic stress symptoms) experienced by individuals and their partners were significantly associated with lower actor relationship quality on average. Interestingly, these effects differed across time and sex. Furthermore, the experience of earthquake-related stress (posttraumatic stress symptoms) experienced was the strongest predictor of relationship quality. These results are expanded upon below.

Actor effects. It was hypothesized that individuals experiencing higher levels of earthquake-related stressors/stress would have lower levels of relationship quality compared to those experiencing lower levels of earthquake-related stressors/stress. Supporting this hypothesis, a significant negative main effect was found for actor posttraumatic stress symptoms. Thus, on average, individuals who experienced higher levels of posttraumatic stress symptoms had lower levels of relationship quality at the start of the study (Time 1). This finding is in line with prior trauma research (e.g., Taft et al., 2010) and natural disaster research more specifically (e.g., Fredman et al., 2010; Monson et al., 2009; Taft et al., 2009). It is

important to note that very few participants in the sample had clinically significant symptoms, and the means indicated relatively low levels of posttraumatic stress symptoms (see Table 3, p. 46). Indeed, those classified with high posttraumatic stress symptoms (i.e., those 1 SD above the sample mean) still had *subclinical* symptoms. Thus, these individuals would be more aptly labelled as experiencing *moderate* posttraumatic stress symptoms.

Although no sex differences were found at Time 1, as hypothesized, the actor posttraumatic stress symptom main effect was qualified in a significant higher-order interaction with sex and time, indicating that the *slopes* of posttraumatic stress symptoms differed between men and women. More specifically, relationship quality decreased significantly over the 15 month study period for men who experienced low posttraumatic stress symptoms throughout the study, but it remained stable for women who also experienced low symptoms. On the other hand, relationship quality remained stable over time for men who experienced high posttraumatic stress symptoms throughout the study period, whereas it declined for women experiencing high symptoms. This same 3-way interaction was significant for actor ongoing earthquake-related stressors. More specifically, relationship quality decreased significantly over the 15 month study period for men who experienced low ongoing earthquake-related stressors throughout the study, but it remained stable for women. However, relationship quality remained stable over time for men when they experienced high ongoing earthquake-related stressors throughout the study period, whereas it declined over time for women.

To my knowledge, this is the first study that has investigated how the effect of actor experienced earthquake-related stressors/stress on relationship quality differs over time *and* by sex. Research by Neff and Karney (2007) suggests that women tend to cope better with their partner's stress than men do, not allowing it to negatively impact their relationship quality unless they are also concurrently experiencing high stress. Indeed, Neff and Karney (2005) found that wives are better at providing effective support when their husbands are stressed than

husbands are. Given this, I suspect that men maintained stable relationship quality while experiencing high posttraumatic stress symptoms during the study period because their wives/female partners were better at stepping in and helping them cope with their symptoms, and men benefitted from it. Husbands/male partners did not provide as effective care, however, and coping was taxed over time as a result for their female partners.

Partner effects. I hypothesized that individuals with partners experiencing high levels of earthquake-related stressors/stress would have lower levels of relationship quality compared to those experiencing low levels of earthquake-related stressors/stress. Supporting the hypothesis, a significant negative main effect was found for partner posttraumatic stress symptoms and partner ongoing earthquake-related stressors. Thus, individuals with partners who experienced higher levels of posttraumatic stress symptoms and ongoing earthquake-related stressors had lower levels of relationship quality at the start of the study (Time 1) on average. This finding is consistent with prior research demonstrating that partner posttraumatic stress symptoms have a negative association with a person's relationship quality (e.g., Lambert et al., 2011). This, however, was the first study to my knowledge to assess partner effects of ongoing trauma-related stressors. Furthermore, it was the first study that assessed any partner effects in the context of a natural disaster (or collective trauma more generally).

The current study is one of the few to document that partner trauma-related stressors/stress effects predict relationship quality when controlling for actor trauma-related stressors/stress effects. This finding is in line with Klaric et al. (2011) and Monk and Nelson Goff (2014), both of whom found partner effects while controlling for actor effects. However, the partner effects are stronger predictors in the current study in comparison to prior studies (e.g., Blow et al. 2013; Klaric et al., 2011; Monk & Nelson Goff, 2014). This might be attributed to the type of traumatic event. As discussed earlier, few studies have investigated collective traumatic events that directly affect both partners. It is possible that partner trauma-

related stressors/stress has a relatively stronger impact on relationship quality in the current context because individuals need to cope with their own reactions and experiences, in addition to those of their partner (cf. Coyne & Smith, 1991). Furthermore, following a collective traumatic event, individuals may be less inclined to make allowances for their partner's negative response to the traumatic event since they can directly compare it to what they or others in the community are experiencing. Prior research has shown that an individual's perceptions of the partner's trauma experience moderates the posttraumatic stress – relationship quality association. For example, Renshaw, Rodrigues, and Jones (2008) found a negative association between military soldiers' posttraumatic stress symptoms and their spouse's relationship quality *only* if spouses believed that they (the military partner) had low combat exposure during deployment. Spouses were buffered from this negative effect if they perceived their partner had high combat trauma exposure.

No partner stressor/stress by sex effects were found. Although no sex effects were hypothesized given the dearth of trauma research that included female participants, the wider stress literature has found evidence that men are less able to cope with their partners' stress than women are (e.g., Neff & Karney, 2007). Future research into this is warranted. Two significant interactions between partner stress and time were found, however. First, the significant partner posttraumatic stress symptom effect mentioned above was qualified within a significant 2-way interaction involving time. Specifically, individuals with partners experiencing higher posttraumatic stress symptoms across the study period had lower relationship quality than those with partners experiencing lower posttraumatic stress symptoms. However, by the end of the study (Time 4), those with partners experiencing higher symptoms had higher relationship quality. The relationship quality of individuals with partners experiencing lower posttraumatic stress symptoms decreased significantly over the study period, but it remained stable over time for individuals with partners experiencing higher

posttraumatic stress symptoms. This same interaction (with the same pattern) also emerged for partner trauma exposure. This is the first study to my knowledge to investigate the effects of partner trauma-related stressors/stress on relationship quality across time.

Across multiple studies, Tesser and Beach (1998) found that when the experienced stress was either low or severe, it had a negative and linear impact on relationship quality. However, at moderate to severe levels of stress, the association with relationship quality weakened significantly. They argue that this occurred because partners were (a) able to recognize that the stress was having an adverse effect on their relationship quality and (b) had the resources to re-correct and change the way in which they interacted under stress (i.e., adaptive processes; Karney & Bradbury, 1995), which was undermining relationship quality. Given this, I argue that individuals with partners experiencing higher posttraumatic stress symptoms (which, as discussed above, more accurately represented moderate levels of symptoms in the current study) were aware of their partner's moderate stress and the impact that it had on their relationship and, as a result, worked harder to maintain their relationship compared to those who had partners experiencing lower levels of stress throughout the study. Cast another way, these individuals were motivated to be more mindful of their relationship and their partner.

Actor by Partner Effects. It was hypothesized that individuals experiencing higher earthquake-related stressors/stress with a partner who was also experiencing higher earthquake-related stressors/stress would have particularly low (i.e., the lowest) relationship quality (in comparison to situations where either they or their partner had higher earthquake-related stress). However, this hypothesis was not supported. No significant actor by partner effects were found. Furthermore, the addition of these variables did not significantly improve the model fit. This finding does not support Klaric's et al. (2011) finding that the lowest relationship quality for wives (of a military veteran husband) was for those who had

posttraumatic stress disorder themselves *and* had husbands with posttraumatic stress disorder. It is noteworthy, however, that Klaric et al. (2011) did not find an actor by partner effect for husbands. The current study is the first to examine these effects postearthquake (or during a collective trauma more generally). Thus, it seems that earthquake-related stressors/stress undermines relationship quality when one partner experiences higher levels and the effect is not different if *both* partners experience higher stressors/stress. It is also possible that no actor by partner effects were found because the current sample did not have enough couples wherein both partners experienced high earthquake-related stressors/stress. Further research is warranted into this issue.

Comparison of Earthquake Stressor/Stress Variables. For all of the hypotheses, I expected that the experience of earthquake-related stress (i.e., posttraumatic stress symptoms) would be a stronger predictor of relationship quality than the actual experience of earthquake-related stressors (e.g., loss of material resources). This is what was found. In the final model that included all of the significant effects, the only effects that remained significant were the effects of posttraumatic stress symptoms. It should be noted that posttraumatic stress symptoms tend to be predicted by earthquake impact measures (in particular trauma exposure and ongoing earthquake hassles) (e.g., Kuijer et al., 2014; Dorahy & Kannis-Dymand, 2012). Thus, these effects may have dropped away in the current study because posttraumatic stress symptoms mediated the link between these more objective stressors and relationship quality. Although this was external to the current study's aims, it may be of particular interest for future research. Despite the finding that actor and partner posttraumatic stress symptoms were the strongest predictors of relationship quality postearthquake out of those examined, a significant main effect was also found for partner ongoing earthquake-related stressors. This is the first study to my knowledge to investigate the chronic stressors related to a traumatic event, and it highlights the importance of the chronic stressors postdisaster (or trauma more generally) as a predictor.

Loss of resources was not significantly associated with relationship quality. This, however, is not surprising as loss of resources was the most objective measure of earthquake-related stress in the current study. It should be noted that this finding is in contrast to Fredman et al. (2010), who found that loss postflood was positively associated with women's relationship quality. Future research into this is warranted.

Conclusion. It is clear that the Canterbury earthquakes had the potential to have an effect on the quality of individuals' romantic relationships. More specifically, the experience of earthquake-related stress (i.e., posttraumatic stress symptoms) had an adverse effect on individuals' relationship quality 14 months after the 2010 earthquake (and eight months following the 2011 earthquake). Furthermore, this effect is dyadic as both actor and partner effects of earthquake-related stress are significant and unique predictors of relationship quality. Further emphasizing the importance of taking a dyadic perspective, the addition of partner effects significantly improved the model fit for each dyadic earthquake-related stressor/stress variable tested. To my knowledge, this is the first study that has shown that including partner variables significantly improves the model fit predicting relationship quality posttrauma. It also revealed interesting sex differences and differences across time (i.e., differences in slopes) for the effects found.

This Chapter explored and determined *how* the stressors associated with the Canterbury earthquakes have impacted individuals' relationship quality over time. However, it is unlikely that all individuals experienced the same outcomes. Thus, Chapter 3 explores possible moderators of the central effects found.

Chapter 3

Rising above the Rubble: The Role of Support Exchanges

Traumatic events, and particularly the posttraumatic stress symptoms that may result, tend to have an adverse effect on relationship quality (e.g., Lambert et al., 2012; Taft et al., 2011). As shown in Part 1 (Chapter 2), the Canterbury earthquakes were no exception. Posttraumatic stress symptoms experienced by individuals *and* their partner had an adverse effect on their relationship quality 14 months after the 2010 earthquake. However, it is unlikely that all individuals experienced this outcome. As mentioned in Chapter 2, Karney and Bradbury (1995) propose that not all couples experience the same relationship outcomes (i.e., lower relationship quality) poststressor. Indeed, some individuals' relationship quality may be resilient or even thrive in the face of adversity. As discussed in Chapter 1, Cohan and Cole (2002) found that rates of both marriage *and* divorce were significantly higher in the affected areas than the non-affected areas in the years following a natural disaster.

It is of particular importance for future intervention and prevention efforts that individuals who are resilient or couples that thrive during adversity are identified. Therefore, examining potential risk and resiliency factors has been noted as a research priority in the stress literature (e.g., Karney & Neff, 2013) and, more specifically, the trauma literature (e.g., Dekel & Monson, 2010). I aim to do this in Chapter 3. More specifically, I explore a possible posttrauma resource available *within* the relationship – support exchanges – that may buffer (protect) individuals from the negative effects that posttraumatic stress symptoms (the strongest effect found in Study 1) typically have on relationship quality. First, I outline the theories exploring the role of *post*stressor resources in the link between stress and relationship quality. I then turn to theory and literature addressing how support exchanges within a relationship could moderate the stress and relationship quality association.

Stress and Relationship Theories Expanded

In Chapter 2, two influential and stress and relationship theories – the VSA Model (Karney & Bradbury, 1995) and the Stress Spillover and Stress Crossover (see Karney & Neff, 2013 for a recent review) were discussed. As already mentioned, these theories are invaluable in understanding how stress might cause a change in relationship quality, however, one limitation of these theories is that they do not include or consider the role of poststress resources in the stress – relationship association.

In the well-established literature investigating individuals' negative psychological reactions (e.g., distress) posttrauma, it is widely accepted that posttrauma resources are theoretically important moderators, which can buffer (protect) an individual from negative psychological reactions posttrauma (e.g., Benight, Cieslak, & Waldrep, 2009; Hobfoll, 1989; 1991). This hypothesis has also received considerable empirical support. For example, available support is consistently found to be an important predictor of posttraumatic stress symptoms (e.g., Brewin, Andrews, & Valentine, 2000; Ozer, Best, Lipsey, & Weiss, 2003). In this section I discuss two stress and relationship theories that incorporate poststress(or) resources as a possible moderator. Although these theories do not adequately explain how stress impacts relationship quality, they are particularly helpful for understanding why/how two couples can have different relationship outcomes despite experiencing the same levels of stress.

The Double ABC-X Model. The first major stress and relationship model was Hill's (1949) ABC-X model, which was revised to the Double ABC-X model by McCubbin and Patterson (1983). In this model (depicted in Figure 8), A is the stressful event (defined as an event that produces or has the potential to produce changes in the family system), B is the family's available resources (broadly defined as anything – current or accumulated poststressor - that may prevent the changes from becoming disruptive), and C is the way in which the stressor is interpreted or defined by the family, which in turn is associated with the coping

strategies they use. Although not represented in Figure 8, the authors also emphasize the importance of preexisting characteristics (i.e., previous hardship). It is the *combination* of each of these factors that predicts the quality and level of family functioning poststressor, which is referred to as the nature and process of the crisis. This outcome can be either positive ('adaption') or negative ('maladaptation'). The model is referred to as the *Double* ABC-X model because it acknowledges that a stressor can lead to additional stressors, resulting in a stressor 'pile-up', which repeats the process. As mentioned in Chapter 2, the model also emphasises the dynamic and fluid nature of this family adaption process, highlighting how new resources can be gained or lost and how the event(s) and coping efforts can be re-interpreted with the passage of time.

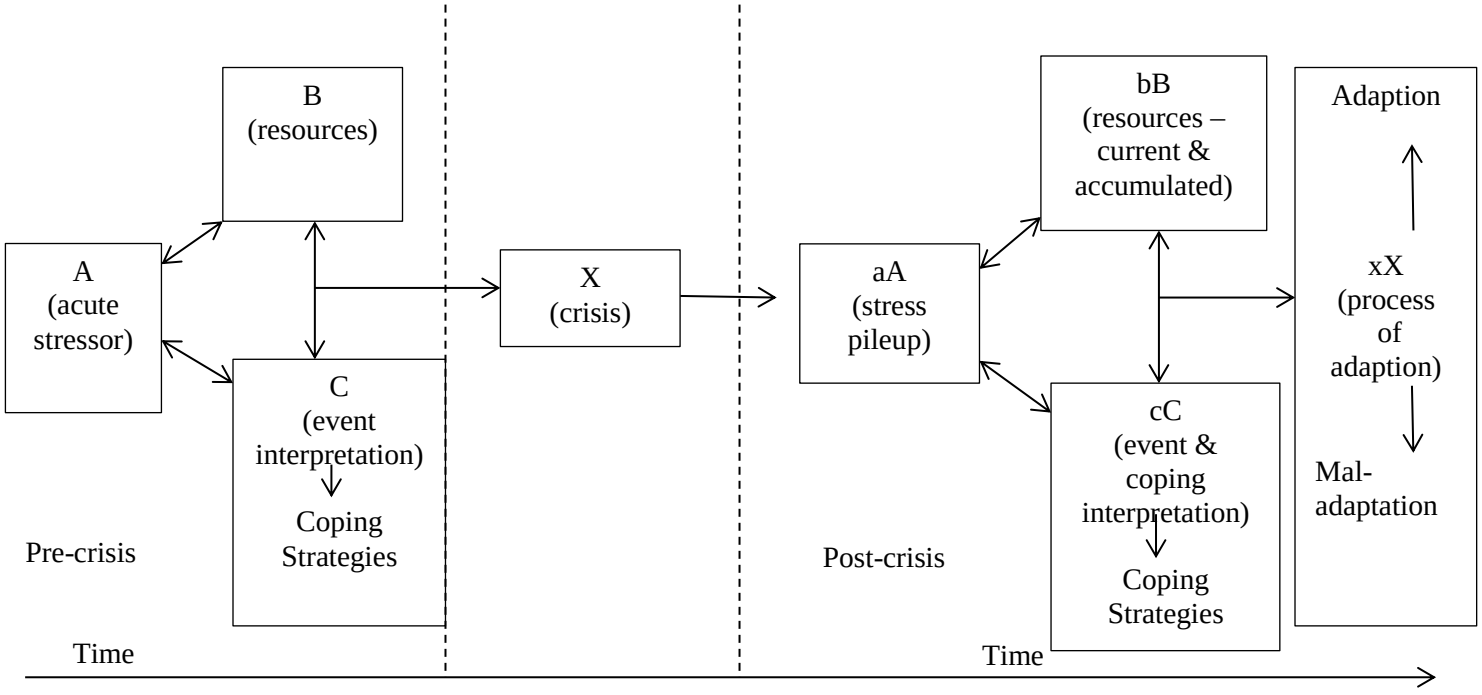

Figure 8 *The double ABC-X Model adapted from McCubbin and Patterson (1983)*

The Couple Adaption to Traumatic Stress Model. Nelson Goff and Smith (2005) developed the Couple Adaption to Traumatic Stress Model, which is the first and only model explaining how *traumatic* stress can specifically impact a range of relationship functioning outcomes. The model was originally applied to situations in which only one partner (the primary trauma partner) was directly exposed to a traumatic event. For the current study, I adapted the model to apply to a dual trauma couple – whereby both partners are directly exposed to the traumatic event. This model, depicted in Figure 9, argues that each partner's posttrauma functioning (i.e., posttraumatic stress symptoms), which can be either acute or chronic, can influence couple functioning (and also each other's posttrauma functioning, although this is beyond the scope of the current review). Guided by McCubbin and Patterson's (1982) Double ABC-X model discussed earlier, they maintain that predisposing factors (e.g., prior trauma, pretrauma mental health, trauma factors, personality, and demographics) and resources (e.g., social support, self-esteem, financial resources, and coping strategies) moderate this association and serve as risk or protective factors.

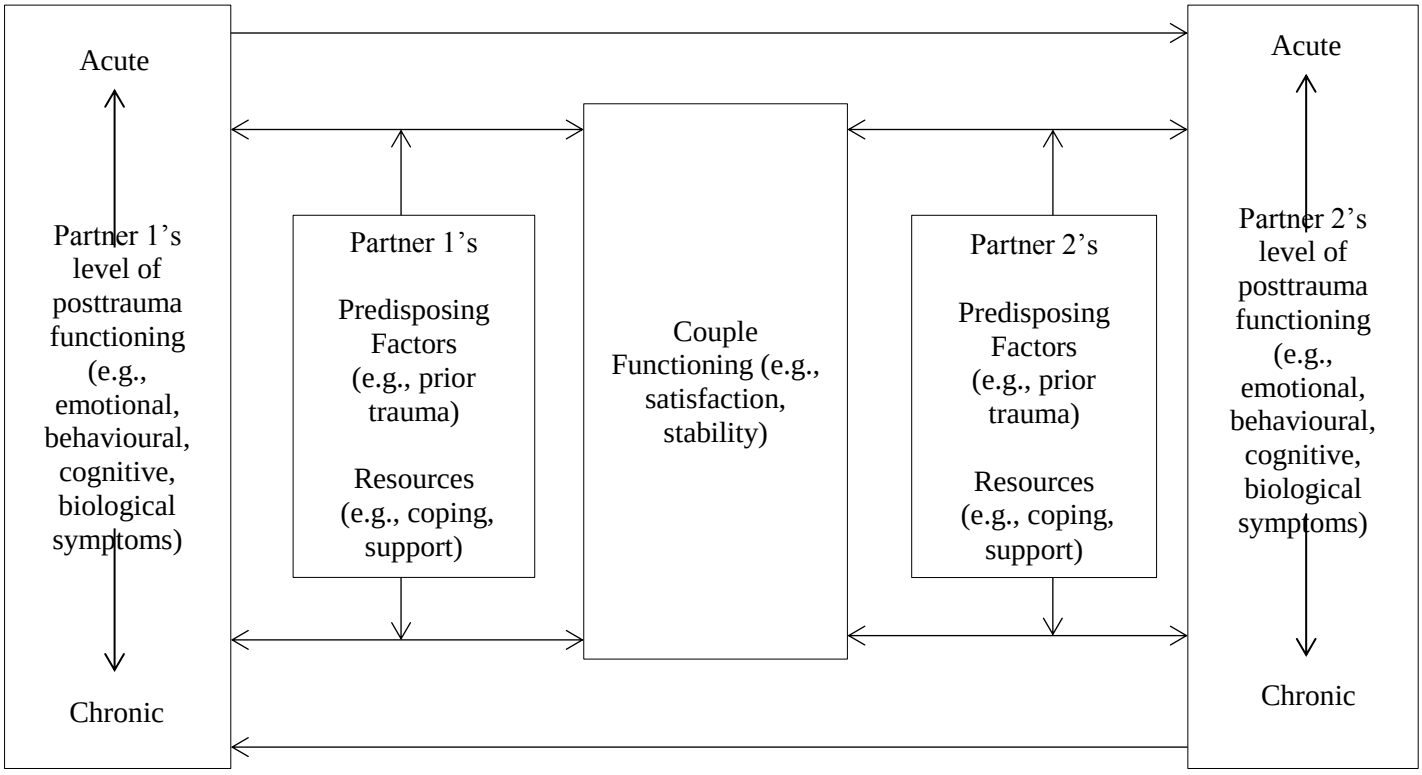

Figure 9 *The Couple Adaption to Traumatic Stress Model adapted from Nelson Goff and Smith (2005)*

Applying the Theories to the Current Study. It is clear that posttrauma resources are theoretically important moderators of the trauma – relationship quality association. More specifically, the resources available or accumulated posttrauma should protect relationship quality from the adverse effects of the trauma-related stressors or the stress that partners experience.

McCubbin and Patterson (1983) argue that received support should be the most important resource, which ought to enable the family to adapt to the stressful event better. Although support is emphasized as the most important resource, the authors focus on support gathered from *outside* the family. However, the focus of the current study is on support gained *within* the family or intimate relationship dyad. Even though support gained from outside the intimate relationship dyad is an important resource, support exchanged within the intimate relationship dyad is *particularly* relevant. First, an intimate partner is usually the most frequent support provider in an individual's support network (e.g., Beach, Martin, Blum, & Roman, 1993). In a qualitative study of military couples (including dual trauma couples and single trauma couples), Nelson Goff et al. (2014) found that receiving support from one's spouse was a common theme, reported by 91% of participants. Second, support from an intimate partner is arguably the most important and beneficial support that an individual can receive. Research has suggested that the lack of support from an intimate partner cannot be compensated for by other support providers (Coyne & DeLongis, 1986). I now turn to a discussion of support within an intimate relationship context to understand how support within a relationship might be a resource in times of stress before reviewing the literature that has examined partner support as a moderator of the trauma – relationship quality association.

Support within the Intimate Relationship Context

Support Defined. Support has been conceptualized as "responsiveness to another's needs and, more specifically, as acts that communicate caring; that validate the other's worth,

feelings, or actions; or that facilitate adaptive coping with problems through the provision of information, assistance, or tangible resources" (Cutrona, 1996, p. 10). Types of support most commonly include emotional support (e.g., offering reassurance and comfort), esteem support (e.g., building the support recipient's esteem by expressing confidence in their competence and ability to deal with what they are facing), tangible support (e.g., offering to or undertaking a task to help the support recipient), and information (e.g., giving advice) (Cutrona, 1996). Support is often measured in one of two ways – as perceived or received. The former refers to how much support an individual believes is available to him/her in times of need, and received support refers to the actual receipt of support (see Lakey, 2013). The current study focuses on received support and considers all types of support together.

Support and Relationship Quality. Reis and colleagues' work emphasises the important role that responsiveness has in fostering positive relationships processes (see Reis & Clark, 2013 for a review). More specifically, they argue that perceived responsiveness (the belief that your partner is attentive to your central needs, goals, and wishes) facilitates intimacy, trust, commitment, and satisfaction. Indeed, providing support is an excellent way to convey that you are responsive to your partner. A theory more specifically tailored to support is the Relationship Enhancement Model (Cutrona, Russell, & Gardner, 2005). In this theory, Cutrona et al. argues that consistently received support leads to higher relationship satisfaction and stability because it enhances perceived support and trust. This is in line with the direct effects model, which argues that individuals benefit from support, regardless of the environment they are currently in (Cohen & Wills, 1985).

Overall, spousal/partner support is positively associated with relationship satisfaction or relationship quality more generally (see Bradbury, Fincham, & Beach, 2000; Sullivan, Pasch, Eldridge, &, Bradbury, 1998 for reviews). Moreover, support exchanges recorded during conflict discussions predict relationship satisfaction, above and beyond other strong predictors

such as conflict management skills (e.g., Pasch & Bradbury, 1998; Sullivan, Pasch, Johnson, & Bradbury, 2010). Thus, it appears that frequent support exchange between partners is associated with greater relationship quality. The question arises, however, *how is support associated with relationship quality in a stress context?*

Received Support and Relationship Quality in a Stress Context. Although Cutrona and colleagues' (2005) Relationship Enhancement Model suggests support is beneficial in any context, she has also argued that support may be particularly beneficial in a stress context. As suggested above, Cutrona (1996) argued that the positive relationship outcomes that result from support occur because support provides recipients with a range of resources (either personal [e.g., self-efficacy, felt security, trust that one's partner is responsive to one's needs, etc. see Cutrona et al., 2005; Reis & Clark, 2013] or tangible [e.g., finances, information]) or it increases the level of resources already available, which enables individuals to cope better with current or future situations, particularly those that are stressful/challenging (Cutrona, 1996). This aligns with the buffering model of support, which maintains that the resources gained from receiving support buffers individuals from the usually negative effects of stress (Cohen & Wills, 1985). Under the buffering model, it is hypothesized that support is crucial in protecting an individual from adverse outcomes. This notion aligns with the Double ABC-X Model and the Couple Adaption to Traumatic Stress Model, both of which were previously outlined. Following from this, received support should be particularly important for individuals experiencing high stress (as opposed to low stress), buffering (protecting) them from the negative effects stress can have on relationship quality.

Graham and Barnow (2013) empirically tested the direct effect and buffering model in a stress – relationship quality context and found support for both models. More specifically, the authors investigated couples (both homosexual and heterosexual) over four time points. For the average person, support received from the partner was significantly associated with higher

relationship quality, irrespective of the level of stress they experienced – supporting the main effect model. However, this relation became stronger as stress increased – supporting the buffering model. Thus, even though support is beneficial to relationship quality regardless of the environment the individual is in, receiving support from an intimate partner is particularly important during times of stress, protecting individuals from the adverse relationship consequences stress has on the average person.

Thus far, I have discussed *actor* effects of received support in a stress context. More specifically, I have discussed why an individual's received support from their intimate partner could moderate the association between the stress they experience and his/her relationship quality (see path A_1 in Figure 10, p. 81). I now turn to discussing why *partner* effects of received support are also important to consider. That is, I discuss the *partner's* perception of received support and how that may buffer the negative effects of *actor* stress on relationship quality of actors (see path B_2 in Figure 10, p. 81).

Coyne and Smith (1991) maintain that when a stressful event impacts both partners in the dyad, coping with it is a "dyadic affair". They argue that when faced with a dyadic stressor, coping requires (a) addressing one's own experiences using problem-focused coping (i.e., attending to various instrumental tasks, such as filling in insurance forms), (b) emotion-focused coping (i.e., reducing or managing felt distress), and (c) coping with or attending to the partner's experiences. The latter dyadic component of coping is referred to as relationship-focused coping, and it involves support exchanges (provision and receipt of support). Thus, not only is received partner support an important resource, *giving* support to your partner, regardless of either partner's level of distress, is an important aspect of effective coping. Moreover, according to equity theory, it is important that there is reciprocity in the exchange of social support for the well-being and relationship satisfaction of both partners (e.g., Kleiboer, Kuijer, Hox, Schreurs & Bensing, 2006; Kuijer, 2009; Kuijer, Buunk, Ybema & Wobbes,

2002). Finally, having a partner experience high stressors/stress is likely to be a stressor/stressful in itself (e.g., Gottman, 1994; Gottman & Notarius, 2000). Thus, it is important that, even in the face of their partner's stress, individuals receive support to facilitate effective coping with *their* current situation.

To illustrate these concepts, consider a hypothetical example applied to the Canterbury earthquakes. As mentioned in Chapter 2, Allie experienced and continued experiencing a number of earthquake-related stressors (e.g., changes to her work, damage to the family home, increased time spent in traffic and aftershocks). She also experienced significant distress. These experiences have led to her have negative interactions with her partner Ben, which has resulted in lower relationship quality for both her and Ben. But what would occur if support exchanges between Ben and Allie were frequent? Despite the high earthquake-related stressors/stress Allie experienced, she received frequent support from Ben. Ben often expressed concern for the distress she was experiencing, and offered to help by providing solutions or advice for her problems and by doing various housework chores. With this support, Allie felt as if she could cope despite the high stress she faced. In addition, each time she received support, she knew that Ben was responsive to her needs, wishes, and goals and would be there in her time of need despite their negative interactions. Furthermore, Allie remained supportive to Ben. Although she had less time to actually help him given the stressors she faced, she often expressed how she loves him, comforted him, and offered advice when he mentioned his own problems. Because Ben was receiving support, he felt that Allie was responsive to his needs, goals, and wishes despite their negative interactions. This also provided him with the resources to cope with the stressors he was experiencing (including coping with Allie's stress). The support Allie provided Ben also demonstrated she was coping relatively well with the stress she faced (cf. Coyne & Smith, 1991). Overall, the support that Ben provides Allie and the support Allie

provides Ben sustains the quality of the relationship for them both in spite of Allie's experience of high stress.

To summarize, support received from an intimate partner should protect an individual from the negative effects that their stress has on his/her relationship quality. Furthermore, having a partner who is also receiving support should protect an individual from the negative effects of his/her stress on his/her relationship quality. The following section reviews the literature examining these processes in a trauma context.

The Support – Relationship Quality Literature Applied to a Trauma Context. In this section, I explore the literature that empirically tests whether support exchanges within an intimate relationship protects individuals from the typically negative effects that a traumatic event can have on their relationship quality. I first examine the literature examining actor effects of received support in a trauma context, followed by partner effects.

Actor Support Effects. All studies that I identified except Broman et al. (1996), who examined a range of traumatic events (illness, death of a child, and a personal attack), have examined a health-related trauma in which one partner had high risk for cancer (Watts et al., 2011), a cancer diagnosis (Belcher et al., 2011; Hagedoorn et al., 2000; Hagedoorn et al., 2011; Hinnen et al., 2008; Knoll, Burkert, Krammer, Roigas, & Gralla, 2009; Kuijer et al., 2000; Regan et al., 2014), or a diabetes diagnosis (Schokker et al., 2010). All of these studies found that patients' received support from their partner was significantly and positively associated with their relationship quality/satisfaction (Hagedoorn et al., 2000; Hagedoorn et al., 2011; Hinnen et al., 2008; Knoll et al., 2009; Kuijer et al., 2000; Regan et al., 2014; Schokker et al., 2010; Watts et al., 2011), intimacy (Belcher et al., 2011), or reported patient relationship improvement (since the diagnosis; Kuijer et al., 2000). Amongst the studies that examined actor effects for spouses of the ill patient (who are also exposed to the traumatic event), spouses' received support from the partner was significantly associated with their relationship

quality/satisfaction (Hagedoorn et al., 2011; Regan et al., 2014; Schokker et al., 2010) or intimacy (Belcher et al., 2011). Broman et al. (1996) also found that experiencing an illness or personal attack only had an adverse effect on marital satisfaction among individuals reporting that they were receiving lower than average support from their spouse.

Although Hagedoorn et al. (2011) found a significant positive association between cancer patients' and spouses' received spousal support and their relationship quality cross-sectionally (support measured three month postdiagnosis predicting relationship quality also measured three month postdiagnosis, and support measured six month postdiagnosis predicting relationship quality also measured six month postdiagnosis), this association was not significant longitudinally (support measured three months postdiagnosis predicting relationship quality measured six months postdiagnosis). However, other studies (Hinnen et al., 2008; Knoll et al. 2009; Schokker et al., 2010) have found significant associations using longitudinal data. For example, Knoll et al. (2009) examined and found significant effects both cross-sectionally (presurgery support predicting presurgery relationship satisfaction, and one year postsurgery support predicting one year postsurgery satisfaction) and longitudinally (presurgery support predicting one year postsurgery satisfaction) in their sample of men undergoing radical prostatectomy for prostate cancer. Furthermore, Belcher et al. (2011) found longitudinal support amongst patients *and* spouses using a daily diary. They found that on days when patients and spouses received support from their partner, they had higher levels of intimacy than on days when they did not receive such support.

Overall, there is strong evidence that individuals' received support has a significant positive association with their relationship quality when they are experiencing a health-related trauma in particular.

Partner Support Effects. Considerably less research has investigated partner effects in the context of a traumatic event. Once again, all identified studies were on a health-related

trauma, in particular cancer (Knoll et al., 2009; Regan et al., 2014). Regan et al. (2014) found a significant partner effect for support, such that partner received spousal support was positively associated with actor relationship satisfaction for both patients of prostate cancer and their wives. Knoll et al. (2009) investigated partner effects in a sample of male patients undergoing radical prostatectomy for prostate cancer and their spouses. Although spouses received emotional support was significantly associated with patient relationship satisfaction cross-sectionally (presurgery support predicting presurgery relationship satisfaction, and one year postsurgery support predicting one year postsurgery satisfaction), it was not significantly associated longitudinally (presurgery support predicting one year postsurgery satisfaction). Overall, the research suggests that partner received support also has a significant positive association with individuals' relationship quality during a health-related trauma.

Major Limitations and Gaps. Overall, the studies discussed above provide evidence that individuals' received support (from their intimate partner) and their partner's received support (from the individual) protects their relationship quality during the experience of a health-related trauma. Few studies, however, have examined partner effects. Future studies examining actor *and* partner effects are needed.

There are also notable limitations in these studies. All of the studies assume that participants are experiencing the same degree of stress by only examining the main effect of actor or partner support on relationship quality. Hagedoorn et al. (2000) highlighted how cancer patients are a heterogeneous sample, experiencing varying levels of cancer severity and distress. To address this limitation, Hagedoorn et al. examined whether there was an *interaction* between support and either physical impairment or distress predicting relationship quality among cancer patients. In support of the buffering model, they found not only a main effect for support, but also that higher support was particularly beneficial (i.e., relationship quality was significantly better) for female patients who had high physical impairment in

comparison to those who had low physical impairment. However, no significant moderation was found for male patients, and no significant moderation was found with distress (as opposed to physical impairment). Indeed, all trauma samples are heterogeneous, therefore, further work applying Hagedoorn et al.'s (2000) approach is needed in this area – particularly work examining both actor *and* partner effects.

A second major limitation is that no studies, to the best of my knowledge, have examined natural disasters or a collective trauma more generally, and past findings are largely constrained to health-related trauma. As discussed in Chapter 2, comparing across traumas may be misleading as the experience of one trauma (i.e., the trauma content), such as cancer, will be different than experiencing another trauma, such as a natural disaster. It is, therefore, important that these effects are explored in traumatic events beyond health-related traumas.

One qualitative study of intimate relationships postnatural disaster suggests that partner support is important in protecting an individual from the negative effects of disaster-related stress and relationship quality. Lowes et al.'s (2012) qualitative postdisaster study of low income women found that decreases in partner support and increases in partner support were associated with negative and positive change in participants' relationships, respectively. They gave an example of a 22 year-old African American woman, who reported positive relationship change and gave the following example of the importance of support:

> "Some days like you'll just sit there, and I was watching the news some days. I just watched shows and cried because that's where I could have been if I would have stayed but for the most part, I was all right. He kept me together" (p. 295).

Although Hagedoorn et al. (2000) did not find that support interacted with distress in predicting relationship quality, this quote suggests that partner support may be an important resource to help facilitate effective coping while dealing with posttraumatic stress symptoms. Furthermore, it is clear that this woman attributed her coping to her partner's support, which no doubt contributed to her positive change in relationship quality.

Finally, although a number of studies have been longitudinal, no studies have taken a developmental approach. As discussed in Chapter 2, studies with three or more waves of data enable one to examine the trajectory of relationship quality in relation to time, support, and the trauma experience, permitting one to infer whether effects change over time or remain stable. It is possible that effects do change over time. For example, partners may be able to initially cope without getting support when an individual is experiencing high stress that is understandable, however, over time, they might become exhausted or frustrated with the lack of improvement, creating tension in the relationship.

To summarize, future work is needed to determine whether actor and partner received support (i.e., support from one's intimate partner) *buffers* the adverse relationship consequences of *high* trauma-related stress. Furthermore, work taking a developmental approach and/or applied to the context of natural disaster in particular is warranted.

"Unsupportive Support." Thus far, I have discussed positive forms of support, however, there are many forms of negative 'support' (i.e., support that is not responsive and potentially harmful; see Cutrona, 1996). For example, a partner may attempt to provide support but instead criticise by saying "Of course you are stressed at work, you are not managing your time well!" or by avoiding discussions about the stressor/stress in a bid to protect the individual. These forms of negative support may have the opposite effect in a trauma context; exacerbating the negative effects stress has on relationship quality as it demonstrates that one's partner is not responsive to one's needs, goals, and wishes and does not alleviate (and most likely adds to) the stressors/stress experienced. As the term negative support is an oxymoron, I will refer to negative support as *negative exchanges* in what follows.

This notion has received empirical support in the health-related trauma literature. I first discuss the research that has investigated actor effects. Hagedoorn et al. (2000) found that although receiving overprotection from one's partner (e.g., excessive praise) was not

significantly associated with relationship quality amongst cancer patients, receiving protective buffering (e.g., supporting the partner by hiding concerns) was significantly and negatively associated with it. Hinnen et al. (2008), Hagedoorn et al. (2011), Regan et al. (2014), and Schokker et al. (2010) also found that the protective buffering cancer patients received from their partners was negatively associated with their relationship satisfaction (especially amongst assertive women in Hinnen et al., 2008) and spouses' relationship satisfaction (excluding Hinnen et al., 2008, who examined effects in patients only). Hagedoorn et al. (2011) and Hinnen et al. (2008) found these effects both cross-sectionally and longitudinally amongst patients, however, Hagedoorn et al. did not find longitudinal evidence for spouses. Finally, Regan et al. (2014) found that actor received negative exchanges was negatively associated with actor relationship satisfaction amongst prostate cancer patients and their wives. As with the support literature, only one study (Hagedoorn et al., 2000) examined actor received negative exchanges as a moderator (as opposed to simply a main effect). The results supported the buffering hypothesis. More specifically, Hagedoorn et al. found high protective buffering was particularly detrimental to relationship quality if patients had high distress or physical impairment.

Only one study (Regan et al., 2014) examined partner effects of negative exchanges predicting relationship quality. Regan et al. found no significant partner effects for negative exchanges amongst prostate cancer patients and their wives.

To summarize, there appears to be evidence that negative exchanges received from an intimate partner are associated with lower relationship quality amongst individuals who experience a health-related trauma. There is no evidence, however, that partners' negative exchanges are associated with individuals' relationship quality. The limitations discussed in the prior section extend to these findings. Further research examining whether individuals' negative exchanges and their partner's reported negative exchanges *moderate* the association

between an individual's trauma-related stressors/stress and his/her relationship quality is warranted, particularly in the context of natural disasters (or traumatic events beyond health-related trauma). Future work taking a developmental perspective is also warranted.

The Current Study

The aim of the current thesis is to determine how the experience of Canterbury earthquake-related stressors and the experience of earthquake-related stress impacts individuals' intimate relationship quality. Part 1 found that actor and partner posttraumatic stress symptoms had an adverse effect on relationship quality after the 2010 earthquake for the average person. Although a significant main effect was also found for partner experience of ongoing earthquake-related stressors, this was not as strong as the former effects. Furthermore, in a final model including all significant effects, only the posttraumatic stress symptom effects were statistically significant.

Part 2 aims to investigate support exchanges within relationships as a possible posttrauma resource attenuating the negative effects of earthquake-related stress (posttraumatic stress symptoms) on relationship quality. Since support can be negative, I not only investigate (positive) support, but also negative exchanges as a factor that may exacerbate the negative effects of earthquake-related stress on relationship quality.

This is the first study to my knowledge to examine these effects in the context of a natural disaster. Further extending previous research and following from Part 1, I adopt a dyadic approach – examining both partners' reported received support/negative exchanges. As with Part 1, I also take a developmental approach, which no prior studies have taken to my knowledge. Part 2 uses the same data used and described in Part 1 (Chapter 2). Part 2's hypotheses are discussed below.

Part 2 Hypotheses. The following hypotheses will be examined in Part 2:

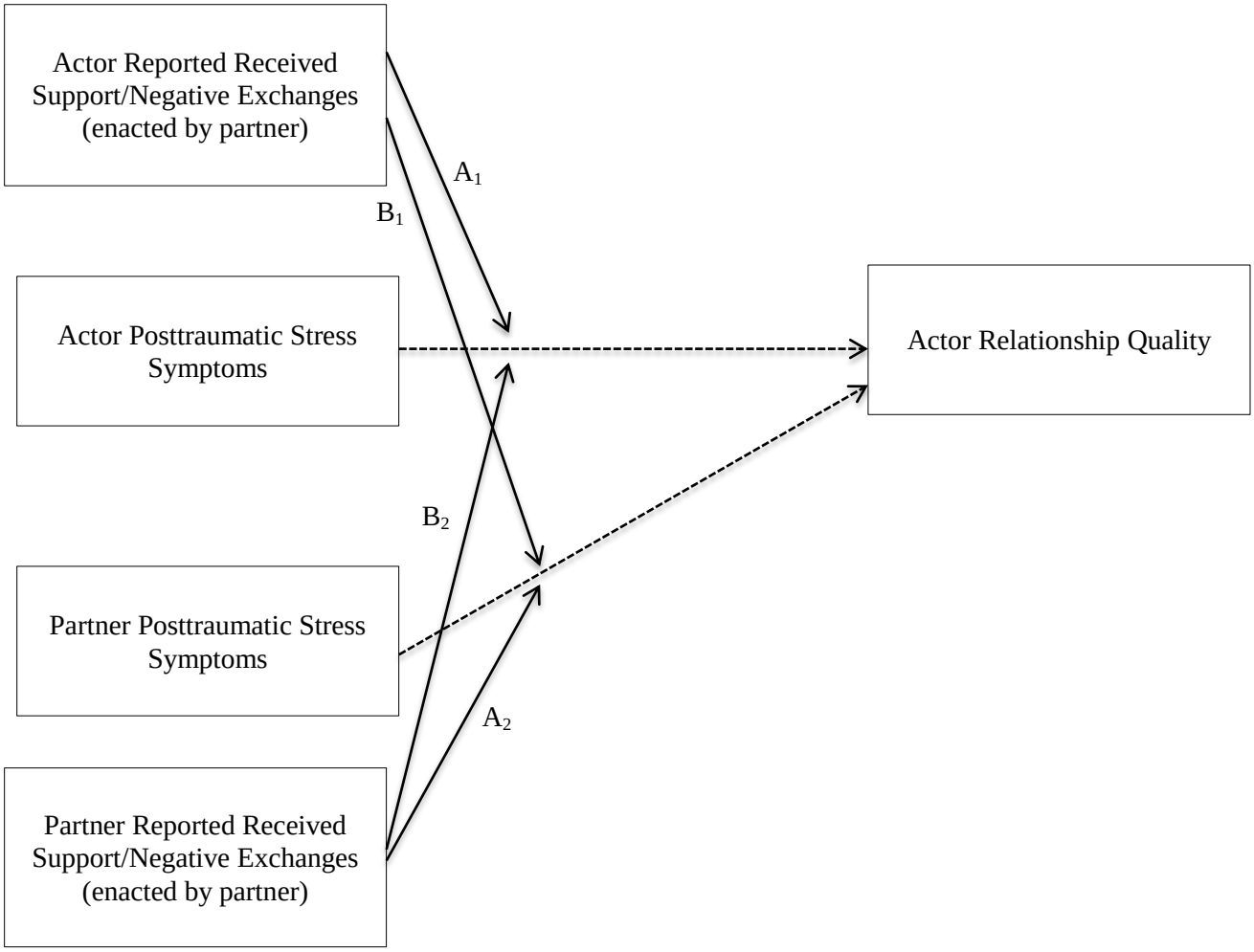

Figure 10 *A dyadic depiction of support exchange moderating the posttraumatic stress symptom associations with relationship quality in the current study*

Hypothesis 1. Based on evidence outlined earlier, I expect that support exchanges will buffer the negative effect that individuals' posttraumatic stress symptoms have on their relationship quality.

First (Hypothesis 1a), I expect that individuals experiencing higher posttraumatic stress symptoms across the study period will have better relationship quality if they report receiving higher levels of support across the study from their partner in comparison to those who report receiving lower levels of support (see path A_1 in Figure 10).

Second (Hypothesis 1b), I expect that individuals experiencing higher posttraumatic stress symptoms across the study period will have better relationship quality if their *partner* reports receiving higher levels of support across the study from the individual in comparison to those who have partners reporting receiving lower levels of support (see path B_2 in Figure 10).

Hypothesis 2. Based on evidence outlined above, I expect that support exchanges will buffer the negative effect that partner posttraumatic stress symptoms have on individuals' relationship quality.

First (Hypothesis 2a), I expect that individuals with partners experiencing higher posttraumatic stress symptoms across the study period will have better relationship quality if their partners also report receiving higher levels of support (from the individual) across the study from their partner in comparison to those who have partners reporting receiving lower levels of support (see path A_2 in Figure 10).

Second (Hypothesis 2b), I expect that individuals with partners experiencing higher posttraumatic stress symptoms across the study period will have better relationship quality if they report receiving higher levels of support (from their partner) across the study from their partner in comparison to those who report receiving lower levels of support (see path B_1 in Figure 10).

Hypothesis 3. Based on evidence outlined earlier, I expect that negative exchanges will exacerbate the negative effect that individuals' posttraumatic stress symptoms have on their relationship quality.

First (Hypothesis 3a), I expect that individuals experiencing higher posttraumatic stress symptoms across the study period will have worse relationship quality if they report receiving higher levels of negative exchanges across the study from their partner in comparison to those who report receiving lower levels of negative exchanges (see path A_1 in Figure 10).

Second (Hypothesis 3b), I expect that individuals experiencing higher posttraumatic stress symptoms across the study period will have worse relationship quality if their *partner* reports receiving higher levels of negative exchanges (from the individual) across the study from their partner in comparison to those who have partners reporting receiving lower levels of negative exchanges (see path B_2 in Figure 10).

Hypothesis 4. Based on evidence outlined above, I expect that negative exchanges will exacerbate the negative effect partner posttraumatic stress symptoms have on individuals' relationship quality.

First (Hypothesis 4a), I expect that individuals with partners experiencing higher posttraumatic stress symptoms across the study period will have worse relationship quality if their partners also report receiving higher levels of negative exchanges (from the individual) across the study from their partner in comparison to those who have partners reporting receiving lower levels of negative exchanges (see path A_2 in Figure 10).

Second (Hypothesis 4b), I expect that individuals with partners experiencing higher posttraumatic stress symptoms across the study period will have worse relationship quality if they report receiving higher levels of negative exchanges across the study from their partner in comparison to those who report receiving lower levels of negative exchanges (see path B_1 in Figure 10).

All possible sex and across time effects were also examined. However, no specific hypotheses were provided given that no studies have been conducted in a natural disaster context and no trauma studies, to the best of my knowledge have taken a developmental perspective. This component of the study is therefore exploratory.

Method

Part 1 and 2 used the same participants and procedure. Thus, the method section only includes information not already mentioned in Chapter 2. For information on the participants and procedures, please refer to Chapter 2's method (pp. 31-42).

Measures. All measures were to be completed by both partners at all four time points.

Posttraumatic stress symptoms. Posttraumatic stress symptoms were assessed using the IES-R (Weiss & Marmar, 1997). Refer to above Chapter for more detail.

Relationship Quality. Relationship quality was measured using the six-item short-form version of the reliable and valid PRQC (Fletcher et al. 2000). Refer to Chapter 2's method for more detail.

Received Support. Received support was assessed with seven items based on work from Van Sonderen (Bridges, Sanderman & van Sonderen, 2002) and Krause (1995). Participants were asked to indicate how often their partner did each of several behaviours (e.g., "show that they loved and cared for you", "give you practical help") in the *past week* using a 1 to 5 response scale (1 = *Never*, 2 = *Rarely*, 3 = *Sometimes*, 4 = *Often*, 5 = *Almost Always;* see Appendix 3 for full questionnaire). Items were summed. The Cronbach Alpha coefficients ranged from .87 to .91 for women and .86 to .91 for men.

Negative Exchanges. A six item scale was used to measure negative exchanges (cf. Bridges et al., 2002; Krause, 1995). Participants were asked to indicate how often their partner did each of several behaviours (e.g., "criticize you", "seem to avoid being around you") in the past week using a 1 to 5 response scale (1 = *Never*, 2 = *Rarely*, 3 = *Sometimes*, 4 = *Often*, 5 = *Almost Always,* see Appendix 3 for full questionnaire). Items were summed. The Cronbach Alpha coefficients ranged from .84 to .91 for women and .87 to .91 for men.

Data Analyses. As with Part 1, data were structured using an APIM (see Kenny, Kashy, & Cook, 2006; Kenny, 1996). Dyadic growth curve models and moderated dyadic

growth curve models were conducted using multilevel modelling (refer to Chapter 2 for further details). As with Part 1, time was centred to the time since the first assessment (Time 1), meaning that time-zero refers to the average time that Time 1 was completed (refer to Chapter 2 for further details). Sex was coded -1 for women and 1 for men. All continuous predictors were centred on the grand mean (Aiken & West, 1991).

A separate model was run for each support variable (received support and negative exchanges) to determine the unique moderating effects of each variable and to avoid issues with low power. The model included actor and partner posttraumatic stress symptoms and their higher-order interactions with sex and time as fixed effects, culminating in two 3-way interactions between sex, time, and actor/partner posttraumatic stress symptoms predicting actor relationship quality. Because Part 1 found that none of the actor by partner effects (including their higher-order interactions with sex and time) were significant and the addition of these variables did not significantly improve model fit, these terms were not included in any of the following models. In addition, each proposed support moderator (i.e., actor and partner received support or negative exchanges scores) and the relevant interactions (involving actor and partner posttraumatic stress symptoms, the support moderator, time, and sex) were included, culminating in four possible 4-way interactions. As Part 1 found no significant quadratic relation with relationship satisfaction (nor did inclusion of the quadratic effect of time significantly improve model fit in comparison to only including the linear effect of time), the only time effects tested were linear time. As with Part 1, all significant interactions found are graphed using 1 *SD* above (for high values) and 1 SD below (for low values) the grandmean of continuous predictors (Aiken & West, 1991). Time was graphed in months using 0 to 15 for the low and high values, respectively, and sex coded was -1 (women) and 1 (men).

Results

Preliminary Results.

Dropout Analyses. For the following dropout analyses, only the Time 1 variables unique to Study 2 (Time 1 received support and negative interactions) were included. Independent-samples *t*-tests were conducted to determine how those (individual partners as opposed to couples) who dropped out (i.e., did not complete all four time points) differed from those who completed the study (i.e., completed all four time points). Men and women were examined separately in these analyses. (Refer to the Results section in Chapter 2 for the dropout analyses for posttraumatic stress symptoms and relationship quality). As shown in Table 8, those who dropped out of the study did not differ significantly from those who completed all four-waves of assessment on Time 1 received support and negative exchanges.

Table 8 *Differences between Time 1 Completers and Time 1 Dropouts on Time 1 Support Exchange Variables*

	Women					Men				
	Completers		Dropouts			Completers		Dropouts		
Variable	*M*	*SD*	*M*	*SD*	*t*	*M*	*SD*	*M*	*SD*	*t*
Received Social Support	28.11	4.56	26.72	6.13	-1.07	26.83	5.28	26.95	4.98	0.10
Negative Exchanges	9.71	3.39	11.44	5.52	1.53	11.90	4.23	12.85	5.35	0.91

Note. For women completers $n = 71$ and dropout $n = 27$. For men completers ranged from $n = 70 – 71$ and dropout $n = 26$

* $p < .05$. ** $p < .01$. *** $p < .001$.

Descriptive Analyses. Table 9 presents the descriptive statistics for variables at each time point of the study, and Table 10 presents correlations between the Time 1 variables (refer to appendix 6 for correlation matrices for Time 2 – Time 4). As shown in Table 9, received support was high and negative exchanges were low on average across the four time points (refer to the Results section of Chapter 2 for relationship quality and posttraumatic stress symptom discussion). As expected, non-independence between dyad members was found (see

the bivariate correlations in Table 9). Relationship quality, received support, and negative exchanges were all were significantly correlated between partners. As found in Part 1, posttraumatic stress scores were significantly correlated between partners at Time 3 only. Refer to Chapter 2's Results to see how interdependence regarding relationship quality was addressed.

Table 9 *Means, Standard Deviations, Correlations, and Dependent T-Tests for the Support Exchange Variables and Relationship Quality*

	Men	Women		
Variable	*M* (*SD*)	*M* (*SD*)	*r*	*t*
Relationship Quality				
14 months post 2010 EQ	37.64 (5.18)	38.32 (3.81)	.45***	1.40
18 months post 2010 EQ	37.51 (4.15)	37.81 (4.37)	.53***	0.42
23 months post 2010 EQ	37.76 (3.74)	37.27 (4.55)	.57***	-1.16
29 months post 2010 EQ	37.18 (4.58)	37.60 (4.00)	.44***	0.93
Posttraumatic Stress Symptoms				
14 months post 2010 EQ	0.51 (0.59)	0.76 (0.70)	.16	2.85**
18 months post 2010 EQ	0.40 (0.46)	0.69 (0.68)	.07	3.10**
23 months post 2010 EQ	0.37 (0.46)	0.56 (0.57)	.23*	2.55*
29 months post 2010 EQ	0.32 (0.50)	0.48 (0.53)	.22	2.12*
Received Social Support				
14 months post 2010 EQ	26.86 (5.18)	27.73 (5.05)	.24*	1.21
18 months post 2010 EQ	27.40 (5.42)	27.81 (5.27)	.28*	0.41
23 months post 2010 EQ	27.59 (4.53)	28.08 (4.36)	.32**	0.79
29 months post 2010 EQ	27.26 (5.24)	27.51 (4.94)	.29*	0.37
Negative Exchanges				
14 months post 2010 EQ	12.15 (4.55)	10.19 (4.13)	.46***	-4.02***
18 months post 2010 EQ	11.74 (4.05)	10.12 (3.77)	.27*	-2.91**
23 months post 2010 EQ	11.04 (3.58)	9.84 (3.44)	.14	-2.24*
29 months post 2010 EQ	11.43 (3.64)	9.85 (3.35)	.33**	-3.49**

Note. Pearson's *r* indicates the correlations between variables collected from partners (e.g., the correlation between the female partner's and male partner's perceived relationship quality).
* $p < .05$. ** $p < .01$. *** $p < .001$.

Table 10 *Correlations for Variables at Time 1 for Men and Women*

Variable	1	2	3	4
1. Relationship Quality	—	-.27**	.44***	-.40***
2. Posttraumatic Stress Symptoms	-.31**	—	-.31**	.36***
3. Received Social Support	.72***	-.13	—	-.52***
4. Negative Exchanges	-.42***	.36***	-.41***	—

Note. Correlations among the variables for men appear below the diagonal; those for women appear above the diagonal.
** $p < .01$. *** $p < .001$.

Table 11 *Relationship Quality as a Function of Actors' and Partners' Posttraumatic Stress Symptoms and Received Support*

Fixed effects	Actor	Partner	Actor × Actor	Partner × Partner	Actor × Partner	Partner × Actor
	b (*SE*)	b (*SE*)	b (*SE*)	b (*SE*)	b (*SE*)	b (*SE*)
Intercept	38.19*** (0.30)					
Sex	0.09 (0.20)					
Time	-0.07** (0.02)					
Sex × Time	-0.02 (0.02)					
PTSS	-0.65* (0.32)	-1.01** (0.32)				
Sex × PTSS	-0.38 (0.34)	-0.24 (0.34)				
Time × PTSS	-0.05 (0.04)	0.11** (0.04)				
Sex × Time × PTSS	0.09* (0.04)	-0.00 (0.04)				
Received Support	0.32*** (0.04)	0.07 (0.04)				
Sex × Received Support	0.04 (0.04)	0.00 (0.04)				
Time × Received Support	0.00 (0.00)	0.00 (0.00)				
Sex × Time × Received Support	0.00 (0.00)	-0.00 (0.00)				
PTSS × Received Support			0.21*** (0.05)	0.04 (0.05)	-0.10 (0.05)	0.04 (0.06)
Sex × PTSS × Received Support			0.16**(0.05)	0.02 (0.05)	-0.09 (0.05)	0.12* (0.05)
Time × PTSS × Received Support			-0.00 (0.01)	-0.01 (0.01)	0.01* (0.01)	-0.00 (0.01)
Sex × Time × PTSS × Received Support			-0.01* (0.01)	-0.02* (0.01)	0.01 (0.01)	-0.01 (0.01)

Note. The actor/partner columns correspond to the order of the fixed effects, b (*SE*). For example, for the interaction *PTSS × Received Support*, the *Actor × Actor* column refers to actor PTSS and actor received support, whereas the *Actor × Partner* column refers to actor PTSS and partner received support. For sex, 1 = men, -1 = women. PTSS = Posttraumatic stress symptoms

* $p < .05$. ** $p < .01$. *** $p < .001$.

Support Exchange Models.

To test the primary hypotheses, a separate model for each support moderator (i.e., received support and negative exchanges) was conducted, including the main effects for time, sex, actor/partner posttraumatic stress symptoms, the actor/partner support moderator, and the relevant higher-order interactions. The results for received support and negative exchanges are expanded upon below.

Received Support.

The results examining received support as a moderator are presented in Table 11. The effects found and discussed in Part 1 remained significant, including the main effect for time and actor and partner posttraumatic stress symptoms, and the higher-order interaction between actor posttraumatic stress symptoms, time, and sex, and the higher-order interaction between partner posttraumatic stress symptoms and time.

The main effect for actor received support was also significant. The more frequent the support individuals said they were receiving from their partner, the higher their relationship quality was at the start of the study on average. The main effect for partner received support was not significant. The higher-order interactions between actor/partner received support, sex, and time, were also not significant. I now expand on the significant interactions relevant to the hypotheses 2a, 2b, 3a, and 3b. The interactions involving actor posttraumatic stress symptoms are discussed first, followed by those involving partner posttraumatic stress symptoms.

Actor Posttraumatic Stress Effects. The interaction between actor posttraumatic stress symptoms and actor received support was significant (see the "actor x actor" column in Table 11). This interaction was qualified by higher-order interactions involving sex, and sex and time (refer to the "actor x actor" column in Table11). The 4-way interaction between actor posttraumatic stress symptoms, actor received support, sex, and time is presented in Figure 11.

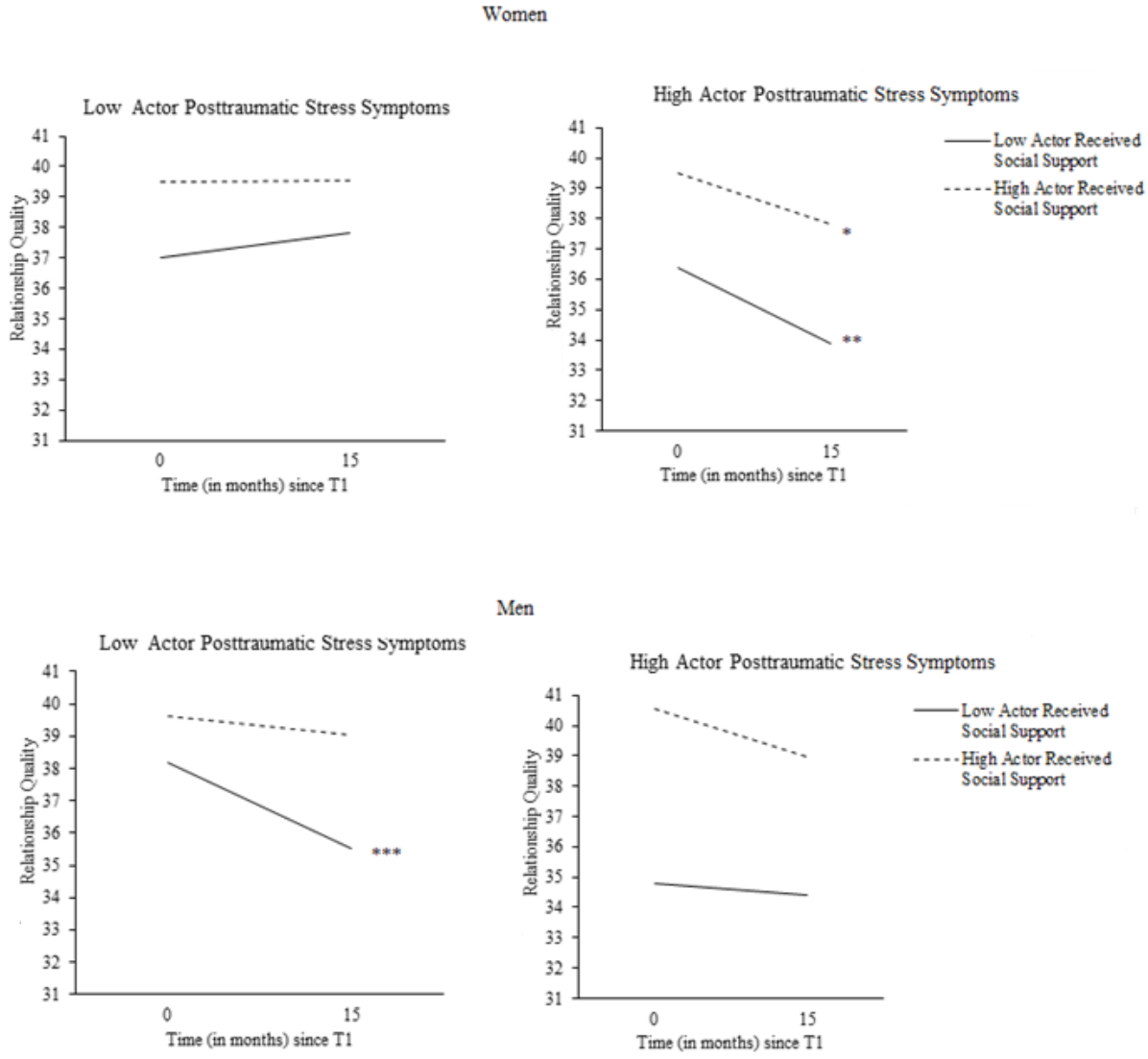

Figure 11 *Linear changes in relationship quality predicted by sex, time (in months) since Time 1, as moderated by actors' reported posttraumatic stress symptoms and actor reported received support*

Relationship quality for men and women low on posttraumatic stress symptoms, reporting high received support across the study period, was high and stable across time, *b* = -0.04, *SE* = 0.05, *t* = 0.05, *p* = .45; b = 0.00, *SE* = 0.05, *t* = -2.13, *p* = .93, respectively. For

men reporting low posttraumatic stress symptoms and low received support, their relationship quality declined steeply over the study period, b = -0.18, SE = 0.04, t = -4.00, p < .001, whereas it remained stable for women with such experiences, b = 0.05, SE = 0.07, t = 0.80, p = .43. Relationship quality was lowest for men and women who reported experiencing high posttraumatic stress symptoms and low received support from their partners, however, relationship quality remained stable for these men over time, b = -0.02, SE = 0.05, t = -0.42, p = .68, whereas it declined significantly for these women, b = -0.17, SE = 0.06, t = -3.00, p = .004. Relationship quality for men experiencing high posttraumatic stress symptoms but reporting high received support from their partner throughout the study was high and stable across time, b = -0.10, SE = 0.07, t = -1.44, p = .16, whereas it significantly declined over time for women with such experiences, b = -0.11, SE = 0.05, t = --2.13, p = .04.

In line with hypothesis 1a, individuals' posttraumatic stress symptoms did not have a negative impact on their relationship quality when they reported receiving high support from their partner. The slopes across time did differ according to sex, however. Of particular interest, it appears that although women experiencing high posttraumatic stress symptoms may initially cope better with receiving low levels of partner support than men (as evidenced by better relationship quality), their coping efforts disintegrate and their relationship quality significantly declines over time. Moreover, high support was not as effective across time for women experiencing high symptoms.

A significant interaction between actor posttraumatic stress symptoms, partner reported received support, and time was also found (refer to the "actor x partner" column in Table 11 and Figure 12). Relationship quality for individuals reporting low posttraumatic stress symptoms who had partners reporting high received support across all four time points was high and stable over time, b = -0.07, SE = 0.04, t = -1.90, p = .06. Relationship quality also remained stable for individuals reporting low posttraumatic stress symptoms who had

partners reporting low received support across the study period, b = -0.01, SE = 0.04, t = -0.13, p = .90, and for individuals reporting high posttraumatic stress symptoms with partners who reported high support, b = -0.05, SE = 0.04, t = -1.36, p = .18. However, relationship quality for individuals reporting high posttraumatic stress symptoms who had partners reporting low received support across the study significantly declined over time, b = -0.15, SE = 0.05, t = -3.14, p = .003. Thus, in line with hypothesis 1b, the extent to which the partner is receiving support is important when understanding how an individual's posttraumatic stress symptoms impact their relationship quality. Although high partner reported support did not buffer the negative effects of an individual's posttraumatic stress symptoms on their relationship quality at Time 1, it did over time (i.e., by Time 4).

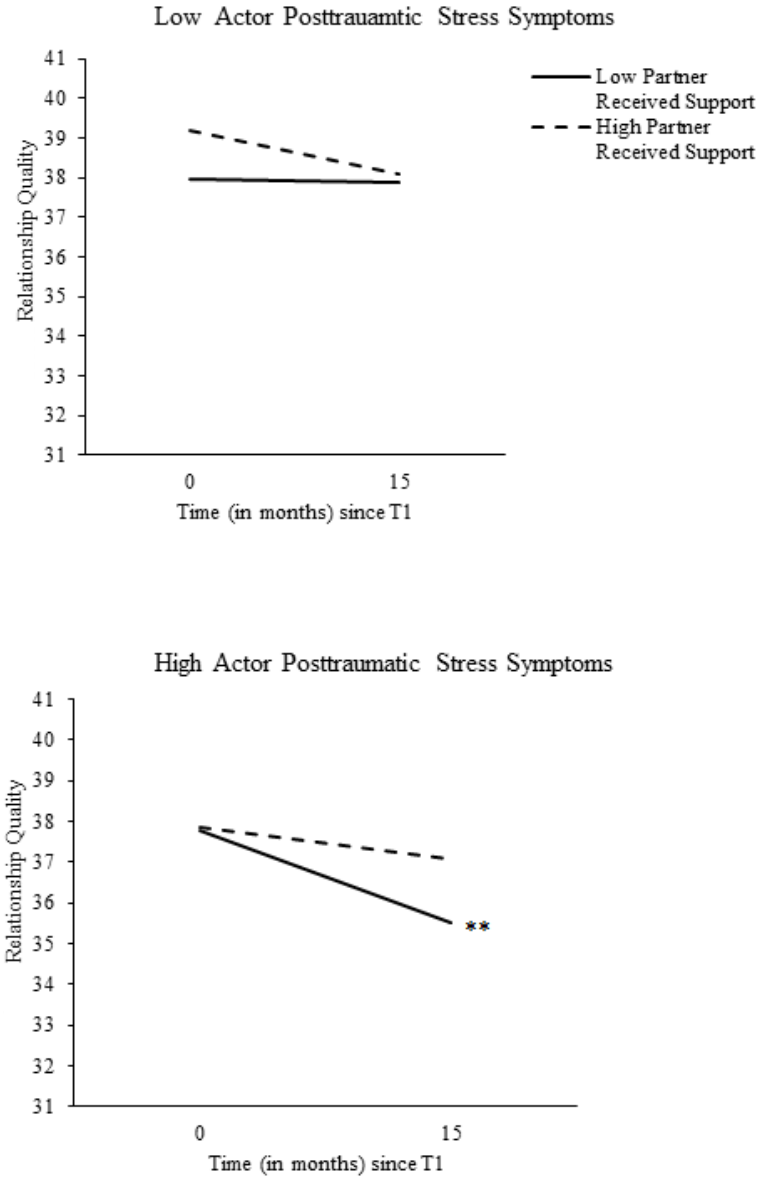

Figure 12 *Linear changes in relationship quality predicted by time (in months) since Time 1, as moderated by actors' reported posttraumatic stress symptoms and partner reported received support*

Partner Posttraumatic Stress Effects. Two significant interactions were found involving partner posttraumatic stress symptoms and actor/partner received support. First, a significant 4-way interaction emerged between partner posttraumatic stress symptoms, partner received support, sex, and time (refer to the "partner x partner" column in Table11 and Figure 13). Relationship quality for men with partners reporting low posttraumatic stress symptoms and high received support across the study was high and stable over time, b = -0.07, SE = 0.05, t = -1.43, p = .16, whereas it declined significantly for women with these partners, b = -0.11, SE = 0.05, t = -2.16, p = .03. Relationship quality for both men and women with partners reporting low posttraumatic stress symptoms but low received support across the study period, declined significantly over time, b = -0.22, SE = 0.07, t = -3.27, p = .002; b = -0.13, SE = 0.05, t = -2.81, p = .007, respectively. Relationship quality for men who had partners reporting high posttraumatic stress symptoms and high received support across the study significantly declined over time, b = -0.12, SE = 0.05, t = -2.30, p = .03, whereas relationship quality for women with such partners remained stable, b = 0.05, SE = 0.07, t = 0.66, p = .52. Finally, relationship quality for both men and women with partners reporting high posttraumatic stress symptoms and low received support across the study remained stable over time, b = 0.07, SE = 0.05, t = 1.26, p = .21; b = -0.03, SE = 0.06, t = -0.50, p = .62, respectively. In regard to hypothesis 2a, despite finding a significant four-way interaction between partner received support, partner posttraumatic stress symptoms, time and sex, there was no clear evidence that partner received support buffered any negative effects of partner posttraumatic stress symptoms. However, for men, having their partner receive high partner support while they were also experiencing high relationship quality across the study period was associated with deterioration in their relationship quality.

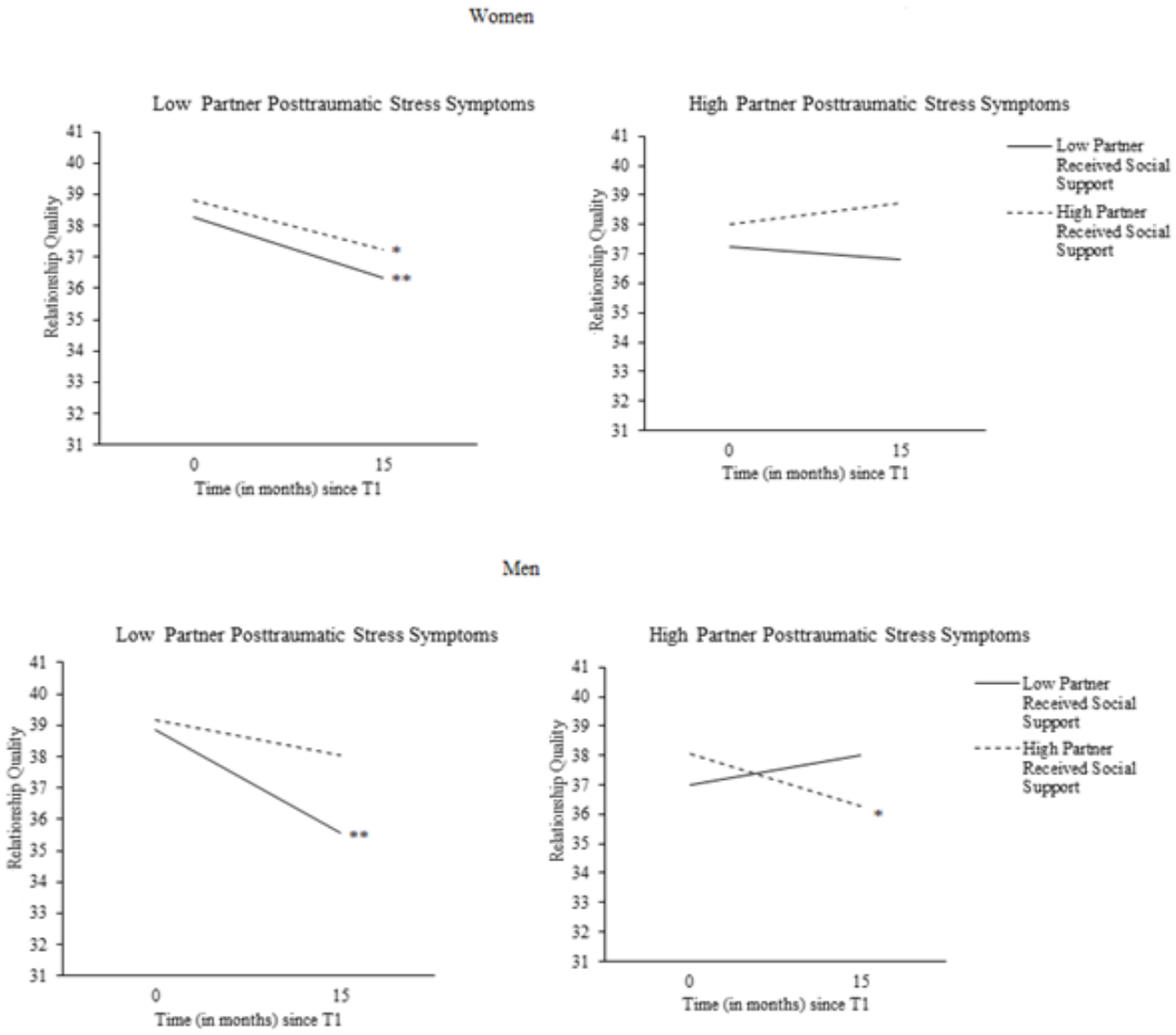

Figure 13 *Linear changes in relationship quality predicted by sex, time (in months) since Time 1, as moderated by partners' reported posttraumatic stress symptoms and partner reported received support*

Second, as shown in the "partner x actor" column in Table 11 and Figure 14, a significant interaction was found between partner posttraumatic stress symptoms, actor received support, and sex. Relationship quality for both men and women reporting high received support did not significantly change according to their partner's reported level of posttraumatic stress symptoms at Time 1, b = -0.46, SE = 0.61, t = -0.75, p = .46; b = -1.18, SE = 0.63, t = -1.88, p = .06, respectively. Thus, when both men and women reported high received support, partner posttraumatic stress symptoms did not have an adverse effect on

their relationship quality at Time 1. Although relationship quality was lower for women who received low support, their relationship quality also did not change according to their partner's posttraumatic stress symptoms at Time 1, b = -0.38, SE = 0.66, t = -0.57, p = .57. However, relationship quality for men who received low support was adversely affected by having a partner who reported high posttraumatic stress symptoms, with these men reporting significantly lower relationship quality at Time 1 if their partner had high posttraumatic stress symptoms in comparison to low posttraumatic stress symptoms b = -2.04, SE = 0.51, t = -4.00, p < .001. In line with hypothesis 2b, receiving support buffered the negative impact that partner experienced posttraumatic stress symptoms had on relationship quality at Time 1. However, this only occurred for men.

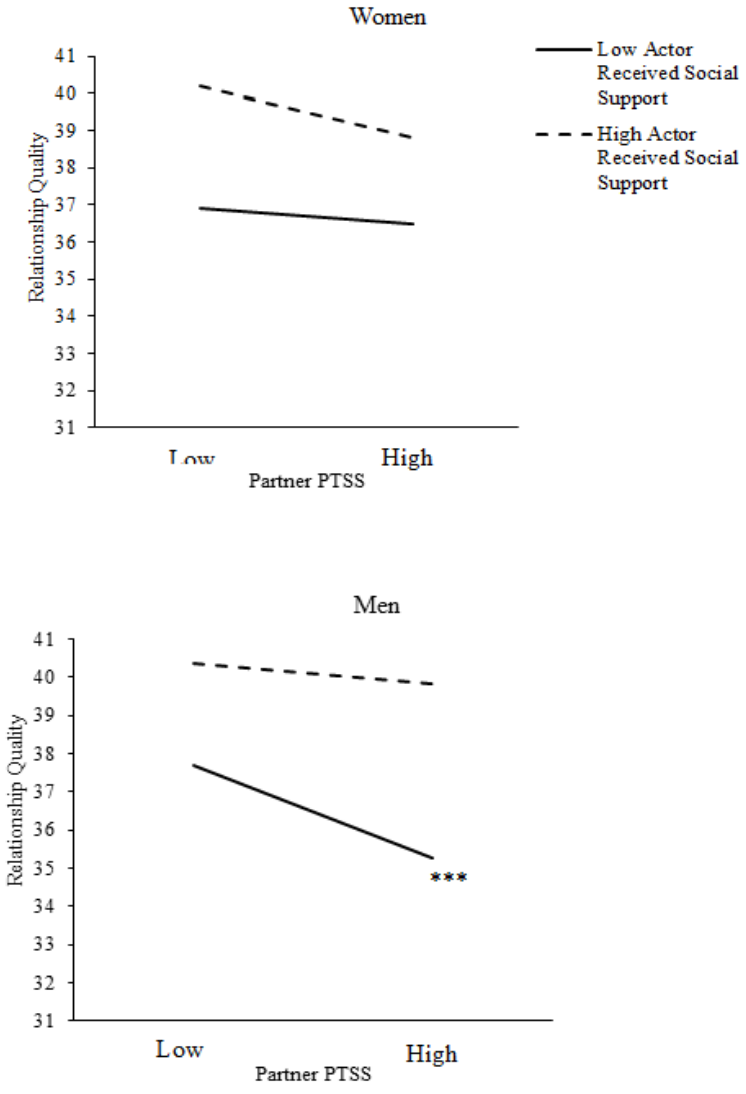

Figure 14 *Linear changes in relationship quality at Time 1 predicted by partner posttraumatic stress symptoms as moderated by actor reported received support and sex.*

Table 12 *Relationship Quality as a Function of Actors' and Partners' Posttraumatic Stress Symptoms and Negative Exchanges*

Fixed effects	Actor	Partner	Actor × Actor	Partner × Partner	Actor × Partner	Partner × Actor
	b (*SE*)	b (*SE*)	b (*SE*)	b (*SE*)	b (*SE*)	b (*SE*)
Intercept	37.94*** (0.36)					
Sex	0.30 (0.23)					
Time	-0.03 (0.03)					
Sex × Time	-0.01 (0.02)					
PTSS	-0.30 (0.37)	-1.23** (0.37)				
Sex × PTSS	-0.05 (0.37)	0.15 (0.37)				
Time × PTSS	-0.20 (0.05)	0.17*** (0.04)				
Sex × Time × PTSS	0.10* (0.05)	-0.04 (0.05)				
Negative Exchanges	-0.31*** (0.05)	-0.03 (0.05)				
Sex × Negative Exchanges	0.03 (0.06)	-0.14* (0.06)				
Time × Negative Exchanges	-0.01 (0.01)	-0.01 (0.01)				
Sex × Time × Negative Exchanges	-0.01 (0.06)	0.01* (0.01)				
PTSS × Negative Exchanges			-0.07 (0.08)	0.09 (0.08)	-0.08 (0.07)	-0.01 (0.07)
Sex × PTSS × Negative Exchanges			-0.11 (0.07)	-0.04 (0.07)	0.00 (0.07)	-0.02 (0.07)
Time × PTSS × Negative Exchanges			-0.01 (0.01)	-0.01 (0.01)	-0.00 (0.01)	-0.00 (0.01)
Sex × Time × PTSS × Negative Exchanges			0.02 (0.01)	0.00 (0.01)	0.00 (0.07)	0.00 (0.01)

Note. The actor/partner columns correspond to the order of the fixed effects, b (*SE*). For example, for the interaction *PTSS × Negative Interactions*, the *Actor × Actor* column refers to actor PTSS and actor negative interactions, whereas the *Actor × Partner* column refers to actor PTSS and partner negative interactions. For sex, 1 = men, -1 = women. PTSS = Posttraumatic stress symptoms

* $p < .05$. ** $p < .01$. *** $p < .001$

Negative Exchanges.

The analyses examining negative exchanges as a moderator are presented in Table 12. The majority of the effects found and discussed in Part 1 remained significant, including the main effect for partner posttraumatic stress symptoms and the higher-order interaction between actor posttraumatic stress symptoms, time and sex, and the higher-order interaction between partner posttraumatic stress symptoms and time. However, the main effects for time and actor posttraumatic stress symptoms were no longer significant.

A significant negative effect was found for actor negative exchanges, such that the higher negative exchanges an individual reported, the lower their relationship quality. The interaction between partner negative exchanges and sex was significant. However, it was qualified in a significant 3-way interaction with time (see the partner column in Table 12).[5] Hypotheses 3a, 3b, 4a, and 4b were not supported as no significant interactions were found between actor and partner posttraumatic stress symptoms and actor and partner negative exchanges.

Discussion

The goal of Part 2 was to determine whether support exchanges within the relationship acted as a moderator of the posttraumatic stress symptom – relationship quality associations found in Part 1, extending prior research by taking a developmental and dyadic perspective. Overall, and in line with hypotheses 1a – 2b, support exchanges within the relationship were a posttrauma resource, protecting individuals' relationship quality from being adversely affected by either their or their partner's posttraumatic stress symptoms. Interestingly, these moderation effects differed across time and sex. This is the first study to

[5] Relationship quality was highest and stable across time for men and women with partners who reported low negative exchanges across the study period, b = -0.06, SE = 0.04, t = -1.48, p = .15; b = 0.06, SE = 0.06, t = 0.98, p = .33, respectively. Relationship quality was also stable for men with partners who reported high negative exchanges across the study, b = -0.02, SE = 0.05, t = -0.34, p = .74. However, relationship quality significantly declined over time for women with partners who reported high negative exchanges across the study, b = -0.11, SE = 0.02, t = -4.85, p < .001.

investigate such effects. Contrary to hypotheses 3a – 4b, however, negative exchanges did not exacerbate the adverse effect that posttraumatic stress symptoms had on relationship quality. These results are expanded upon in more detail below.

Support Buffering Posttraumatic Stress Symptoms.

Actor Posttraumatic Stress Symptoms. Based on prior theory and research, I first expected (hypothesis 1a) that individuals who experienced higher posttraumatic stress symptoms across the study would have better relationship quality if they reported receiving higher levels of support across the study from their partners compared to those who reported receiving lower levels of support. The results supported this hypothesis. Individuals' high posttraumatic stress symptoms only had a negative effect on their relationship quality when they reported receiving low support from their partners. Although those reporting high received support with low posttraumatic stress symptoms across the study also had higher relationship quality than those reporting low support and low posttraumatic stress symptoms, the difference between those receiving high and low support was greater among those who experienced high posttraumatic stress symptoms. This result is consistent with theory (e.g., the buffering hypothesis, Cohen & Wills, 1985 and Cutrona, 1996) and prior research (e.g., Graham & Barnow, 2013). This is the first study to examine this effect in the context of a natural disaster. It is, however, contrary to one trauma-context study (Hagedoorn et al. 2000), which found no evidence that received support from one's spouse buffered individuals from the adverse effects that psychological distress had on relationship quality in cancer patients.

The results also revealed sex differences across time for the actor received support by actor posttraumatic stress symptom effect. Of particular interest, women reporting low received support and high posttraumatic stress symptoms over the study period had slightly higher relationship quality than men did at Time 1. However, their relationship quality

declined over time. On the other hand, men reporting the same support and posttraumatic stress symptom levels had stable relationship quality over time. The current study is the first trauma study to investigate such effects. Prior research has consistently demonstrated that women have a wider support network than men (e.g., Turner & Marino, 1994). Furthermore, women are more inclined to seek support from their available network as a coping strategy in response to stress than men are (e.g., Bradbury & Karney, 2013; Ptacek, Smith, & Dodge, 1994). Specific to disasters, Kaniasty and Norris (1995) and Tyler (2006) found that women received significantly more support from their support network than men postdisaster and Marshall et al. (2014) found that women reported experiencing greater growth in relationships (i.e., increased closeness with friends and family) postearthquake than men. Moreover, women are more frequently the caregivers in the relationship and are more effective support providers during trying times (e.g., Cutrona, 1996; Hagedoorn, Sanderman, Coyne, Bolks, & Tuinstra, 2008; Karney & Neff, 2005; Shumaker & Hill, 1991). Indeed, Iida, Parris Stephens, Rook, Franks, and Salem (2010) found that wives provided more support when husbands experienced diabetes-specific anxiety, whereas husbands did not. Provided this, one would expect that men would rely more heavily on their spouse/partner for support in times of stress. This may explain why women's relationship quality at Time 1 is not as adversely affected as men's, when they experienced higher posttraumatic stress symptoms and report receiving lower levels of support from their partners. However, lack of support from a romantic partner cannot be compensated for by other support providers (Coyne & DeLongis, 1986). This is reflected in the finding that although women have a slight advantage at Time 1, women and men who have lower support and higher posttraumatic stress symptoms across the study period had comparable relationship quality by the end of the study (at Time 4).

It is also interesting that relationship quality for women who experienced higher posttraumatic stress symptoms and reported higher support from their partners (over the 4 time points) declined significantly over the study period, whereas men remained stable. Research (e.g., Neff & Karney, 2005) has found that women are better/more responsive at providing support than men are in times of stress. Although this difference is small, this decline may suggest that the support women received from their male partners was not as effective at Time 4 as the support men received from their female partners.

As support reciprocation is important in intimate relationships (e.g., Kuijer, 2009) and effective coping during stress that effects both partners involves not only receiving support but also giving it to one's partner (Coyne & Smith, 1991), I expected in Hypothesis 1b that individuals who experienced higher posttraumatic stress symptoms across the study would have better relationship quality if their *partner* reported receiving higher levels of support across the study from them in comparison to those who had partners who reported receiving lower levels of support. The results were partially supported. Contrary to the hypothesis, individuals with high posttraumatic stress symptoms with partners who reported higher levels of support across the study had equivalent relationship quality at Time 1 compared to those with high symptomology and partners who reported lower support. However, in line with the hypothesis, individuals with high symptoms and partners who reported lower support had declining relationship quality over the study period, whereas those with partner's who reported higher support had stable relationship quality. This is the first trauma context study to examine such effects.

A possible explanation for this effect may revolve around what the partner attributes the lack of support to. Attribution theory (Heider, 1958) maintains that the attributions a partner makes in response to a relationship event should determine how it impacts relationship quality. Indeed, research has found that attributions that amplify the effect of

negative events that occur in the relationship and those that suppress the effect of positive events are associated with lower relationship satisfaction (e.g., Bradbury & Fincham, 1990; Fincham & Bradbury, 1993; Fincham, Harold, & Gano-Phillips, 2000).

In the context of stress, Thompson and Bolger (1999) studied couples in which one partner was about to undertake a stressful exam. They found that the negative mood experienced by the examinee transferred to the partner. This association, however, weakened significantly as the date came closer to the exam. They suggested that this is because of the salience of the event, which made participants aware of the negative effect of stress, which in turn enabled them to make allowances for the examinee's behaviour. In the context of the current study, an individual may initially make allowances when he/she receives low levels of support from their partner when he/she are experiencing high posttraumatic stress symptoms. However, as time passes and the event becomes less salient, they may find it more difficult to cope with a partner who is *still* experiencing high symptomology and are *still* receiving low levels of support. This stress should lead to more dysfunctional interactions, resulting in lower relationship quality for both partners.

Partner Posttraumatic Stress Symptoms. For Hypothesis 2a, I expected that individuals with partners who experienced higher posttraumatic stress symptoms across the study would have better relationship quality if their partners also reported receiving higher levels of support across the study from their partners compared to those who had partners who reported receiving lower levels of support. Although the results revealed a 4-way interaction between sex, time, partner posttraumatic stress symptoms, and partner reported support, there was no clear evidence that partner reported received support buffered the negative impact partner posttraumatic stress symptoms had on an individual's relationship quality. This is the first trauma context study to investigate such effects to my knowledge.

In this 4-way interaction, women with partners who experienced higher posttraumatic stress symptoms had slightly higher relationship quality when their partners also reported receiving higher support in comparison to when they reported lower support. These levels remained relatively stable over time. Interestingly, men with partners who experienced higher posttraumatic stress symptoms and also reported higher support also had slightly higher relationship quality at Time 1, but it declined significantly over time, such that these men had lower relationship quality at Time 4 than those with partners who reported higher symptomology and lower partner support. Why might this effect occur? As mentioned prior, Neff & Karney (2005) found that women are better/more responsive at providing support than men. More specifically, men tend to provide both support and act negatively in response to their spouse's stress. This decline over time might reflect the fact that men's constant provision of support to their partner who is experiencing high symptoms takes a toll on their relationships as they become more frustrated and taxed over time.

For Hypothesis 2b, I expected that individuals with partners who experienced higher posttraumatic stress symptoms across the study would have higher relationship quality if they reported receiving higher levels of support across the study from their partner in comparison to those who reported receiving lower levels of support. The results partially supported this hypothesis. Relationship quality for women did not differ at Time 1 according to their partner's level of posttraumatic stress symptoms when considering their level of reported support. For men, however, it was clear that the negative effects that partner posttraumatic stress symptoms had on relationship quality at Time 1 was buffered by their own reported levels of higher partner support. Prior research by Karney and Neff (2007) found that husbands did not cope with their wives stress as well as women did, showing that only husbands experienced decreases in satisfaction when their spouses experienced higher levels of stress. Although the results of Part 1 did not show such a sex difference for the partner

posttraumatic stress effect, the consideration of support lends some support to this finding that women are better at coping with their partner's stress, regardless of the support they receive. On the other hand, it appears that men need to be receiving some support to 'cope' with their partner's stress. As mentioned earlier, men tend to rely on their spouse/partner for support, whereas women have a wider support network on which they can rely. Thus, when support is lacking from their partner, men may have fewer resources available to them to cope effectively with the stressors they are facing, which is their partner's own stress in this context.

Negative Exchanges Exacerbating Posttraumatic Stress Symptoms. For hypothesis 3, I expected that negative exchanges (actor for hypothesis 3a, and partner for hypothesis 3b) in the relationship would exacerbate the negative effect that actor posttraumatic stress symptoms had on relationship quality. In hypothesis 4, I further expected that negative exchanges (partner for hypothesis 4a, and actor for hypothesis 4b) would exacerbate the negative effect that partner posttraumatic stress symptoms had on relationship quality. The results did not support any of these hypotheses. One possible reason for this is that the current sample consisted of relatively happy couples, with fairly high relationship satisfaction, support, and low negative exchanges (see Table 9, see p. 87). Prior research suggests that negative exchanges do not have adverse effects on couples who are relatively satisfied with their relationships (in comparison to those who are less satisfied, e.g., Sanford, 2014). Thus, negative exchanges may play a more important moderating role in more distressed couples. This is the first study to my knowledge to consider negative exchanges as a moderator of the posttraumatic stress symptoms effect on relationship quality. Future research is needed.

Conclusion. In conclusion, these results demonstrate that even though negative exchanges in the relationship are not a moderator of the actor and partner posttraumatic stress

symptoms – relationship quality associations found in Part 1, support exchanges are. More specifically, the results suggest that individuals' reported support from the partner is an important resource, protecting relationship quality from being undermined by their own posttraumatic stress symptoms. The results also suggest the importance of considering not only individuals' own reports of support, but their partner's as well. Although partner reported support is not initially important in protecting individuals from the adverse effects of their high posttraumatic stress symptoms on their relationship quality, it is in the longer-term. Interestingly, and contrary to expectations, partner reported support did not buffer the negative effects of partner high posttraumatic stress symptoms on individuals' relationship quality, and sex effects also emerged. Overall, these effects suggest that although women are initially better at coping with a lack of support than men (as evidenced through better relationship quality) these effects appear to disintegrate over time. In addition, the support women get from their male spouses/partners is not as effective as the support men get from their female spouses/partners in attenuating the negative effects that posttraumatic stress symptoms have on relationship quality over time. Finally, when considering individuals' reported support, women appear to be able to cope with their partner's posttraumatic stress symptoms better, with this experience not negatively affecting their relationship quality at Time 1. Partner posttraumatic stress symptoms, however, have a negative effect on Time 1 relationship quality for men *if* men report that they are receiving lower support from their partners. The theoretical and practical implications and applications of these findings are discussed in Chapter 4.

Chapter 4

General Discussion

Adopting a dyadic *and* developmental perspective, the current study sought to determine how earthquake-related stressors and experienced stress after the Canterbury earthquakes impacted individuals' intimate relationship quality over time. More specifically, Part 1 (Chapter 2) explored how the earthquake-related stressors (i.e., loss of material resources, trauma exposure, and ongoing earthquake-related stressors) and stress (i.e., posttraumatic stress symptoms) experienced by individuals and their partners affected their relationship quality over a period of 15 months. Building on the results of Part 1, Part 2 (Chapter 3) examined whether support exchanges within the relationship served as a possible posttrauma resource, attenuating any negative effects of earthquake-related stress (posttraumatic stress symptoms) on relationship quality. Because support can be negative, I not only explored positive support, but also whether negative exchanges exacerbated the negative effects that earthquake-related stress had on relationship quality.

Central Themes

Individuals' Relationship Quality Demonstrates Resiliency. This is the first quantitative study to my knowledge that has examined the effect of a *natural disaster* on relationship quality. Indeed, as revealed in Part 1 (Chapter 2), a significant main effect demonstrated that actor and partner posttraumatic stress symptoms and partner ongoing earthquake-related stressors were negatively associated with relationship quality at Time 1 on average. However, once one looks beyond these effects (i.e., the significant interactions within which they are qualified and the other stressor variables) and considers the moderating role of support exchanges within the relationship, a theme emerges. Overall, individuals' relationship quality was relatively resilient postdisaster.

In Part 1, the partner effect for posttraumatic stress symptoms was qualified by a 2-way interaction with time. Although individuals with partners who experienced higher posttraumatic stress symptoms across the study had lower relationship quality at Time 1 than those with partners who experienced lower posttraumatic stress symptoms, they had higher relationship quality by the end of the study (at Time 4). Relationship quality significantly decreased over the study for individuals with partners who experienced lower posttraumatic stress symptoms, whereas it remained stable for individuals with partners who experienced higher posttraumatic stress symptoms. Based on Tesser and Beach (1998), I propose that this might have occurred because individuals with partners who experienced higher posttraumatic stress symptoms (which, as discussed earlier, is more accurately represented as moderate rather than severe levels of symptoms) were aware of their partner's stress and the impact it had on their relationship and, as a result, worked harder to maintain their relationship compared to those with partners who experienced lower levels of stress throughout the study. The same 2-way interaction also emerged for partner trauma exposure and partner ongoing earthquake-related stressors (although the latter 2-way interaction was no longer significant when actor by partner effects were included in the model).

It is also notable that no significant main effects were found for loss of material resources or actor/partner trauma resources. Furthermore, the posttraumatic stress symptom effects were the only significant predictors in a final model that included all the significant effects found. Thus, it appears that it is the experience of stress - not necessarily the earthquake-related stressors themselves - that impacts relationship quality. This is not surprising. As mentioned in Chapter 1, Lazarus and colleagues (e.g., Lazarus, 1966; Lazarus & Folkman 1984) argue that the experience of stress (emotional, behavioural, physiological, and cognitive responses) following a potential stressor depends on the *appraisal* of the event, not the event itself.

In Part 2, I found that individuals' relationship quality was resilient in the face of experiencing high posttraumatic stress symptoms if they received more support from their partner. Moreover, partner posttraumatic stress symptoms *only* negatively impacted men's relationship quality at Time 1 when they were receiving lower than average support from their stressed partner. Furthermore, negative interactions did not exacerbate the association between actor/partner posttraumatic stress symptoms and relationship quality. Finally, the significant decreases in relationship quality found throughout the study were relatively minimal (i.e., 1 – 3 points on a 0 – 42 point scale).

Individuals' relationship quality was, overall, resilient to the experience of earthquake-related stressors/stress, particularly when one considers the posttrauma resources that were available. This is consistent with the trauma literature. Traditionally, the trauma literature has assumed that the exposure to a traumatic event would lead to negative psychological reactions (e.g., posttraumatic stress symptoms). However, a recent movement has highlighted that this may often not be the case (see Bonanno, 2004; Bonanno & Mancini, 2012 for reviews) showing that a majority of individuals are resilient postdisaster (they maintain normal functioning in spite of the trauma) or experience only acute negative outcomes postdisaster and recover relatively soon after the event (see Bonanno et al., 2010). It is important that future research considers this human capacity to maintain functioning in spite of adversity. This has also been highlighted as a research priority in the more general stress and relationship literature (see Karney & Neff, 2013).

The current study demonstrated how different individuals with higher posttraumatic stress symptoms or with partner's who had higher posttraumatic stress symptoms can have different relationship quality outcomes postdisaster, based on whether they have a posttrauma resource available, namely – support exchanges within the relationship. Future research in other trauma contexts may benefit from exploring this moderator as well. Furthermore, future

research may also benefit from exploring other possible moderators (i.e., pre-existing vulnerabilities, event interpretations, coping strategies, and other posttrauma resources) that may explain why couples have different relationship quality outcomes postdisaster (or trauma more generally). Not only will this expand our current understanding of how traumatic events impact relationships; it will also inform future prevention and intervention efforts.

Although a theme of resilience was evident in the results, it is important that the instances in which relationship quality was adversely impacted (albeit minimally) are acknowledged. First, relationship quality was compromised for individuals who experienced higher posttraumatic stress symptoms and received lower support from their partners. It is also notable that this effect became stronger over time for women. Second, relationship quality was compromised for individuals who experienced more posttraumatic stress symptoms and had a partner who received lower support in the longer-term (at Time 4). Third, relationship quality was lower at Time 1 for men who received lower support and had partners who experienced higher posttraumatic stress symptoms.

Developing and implementing effective psychosocial services postdisaster is of upmost importance to ensure that negative reactions in individuals are minimized (see Mooney et al., 2011 for a review applied to the Canterbury earthquakes). Mooney et al. recommend a strength-based approach to psychosocial recovery. This approach draws upon existing resources and focuses on resilience and empowerment by first identifying available resources (or strengths) and vulnerabilities. The current results suggest that prevention and intervention efforts should target couples who have low support exchanges in their relationship and in which one partner is experiencing high posttraumatic stress symptoms. I explore the possible strategies tailored to the sex of the partners in an upcoming section.

The Partner's Experience is also Important. In Chapter 2, I discussed the theoretical importance of not only considering an individual's stressor/stress experiences

(actor effects), but also their *partner's* stressor/stress when determining how a stressful event impacts a partner's relationship quality (partner effects) (see the stress spillover and stress crossover model, Karney & Neff, 2013). Indeed, one of core features of intimate relationships is interdependence. More specifically, the way one partner in an intimate relationship thinks, feels, and ultimately behaves has a strong influence on the other partner's thoughts, feelings, and behaviours (see Arriaga, 2013). Moreover, as noted in Chapter 3, successful coping with an event (or events) such as the Canterbury earthquakes is a "dyadic affair" (Coyne & Smith, 1991) requiring reciprocity of support between partners. Despite this strong theoretical evidence, relatively few studies have examined both actor and partner effects. Given this, the current study took a dyadic perspective, exploring both actor and partner effects for the proposed predictors (earthquake-related stressors/stress) and for the moderators (i.e., support and negative exchanges) using rigorous statistical analyses (unlike the majority of the prior trauma literature; see Kenny et al., 2006; Kenny, 1996).

The findings generally supported this theory, consistently demonstrating why it is important to not examine an individual's experience in isolation in order to better understand his/her relationship quality outcome, but to examine his/her partner's experience as well. In Part 1 (Chapter 2), significant partner effects of posttraumatic stress symptoms and ongoing earthquake-related stressors were revealed (while controlling for actor effects), such that higher levels were associated with lower levels of relationship quality at Time 1. In addition, the partner posttraumatic stress symptom effect was qualified in a higher-order interaction with time and a partner effect was also found for the 2-way interaction between trauma exposure and time. Further emphasizing the importance of taking a dyadic perspective, the addition of the partner effects significantly improved the model fit for each dyadic earthquake-related stressor/stress variable that was tested.

Part 2 found further support for the importance of partner effects while controlling for actor effects. First, *partner* reported received support was a significant moderator of actor posttraumatic stress symptoms across time. Individuals with higher posttraumatic stress symptoms with partners who reported higher levels of support across the study had equivalent relationship quality at Time 1 of those with higher symptomology and partners who reported lower support. However, individuals with higher symptoms and partners who reported lower support had declining relationship quality over the study, whereas those with partner's who reported higher support had stable relationship quality. Second, men were protected from the negative effects that higher partner posttraumatic stress symptoms had on relationship quality by their own reported levels of higher partner support.

It is important for future research in the trauma literature to take a dyadic perspective, collecting and analysing data obtained from both partners as opposed to one. Furthermore, future intervention efforts and prevention efforts would benefit by including both partners. For example, if an individual is experiencing high stress and seeks help, it is important that professionals involved obtain reports of the partner's experience as well. Indeed, this study's findings support the common phrase that "no man is an island".

Coping with Stress is a Fluid, Dynamic Process. McCubbin and Patterson (1983) maintain that the family adaption process for coping with a stressful event is dynamic and fluid given that coping efforts can be exhausted or maximised over time, consequently changing relationship outcomes. Despite the fact that this theoretical notion is not new, little research has applied it. As discussed in Chapter 2, little trauma research is longitudinal, and no studies, to the best of my knowledge, have taken a developmental perspective, examining whether certain effects (i.e., the effects of stressors/stress on relationship quality) change over time. Therefore, the current study employed growth curve modelling techniques using

multilevel modelling to determine whether the effects examined do, in fact, change over time. Given the dearth of literature taking this approach, this aspect of the study was exploratory.

The current study provided strong support for McCubbin and Patterson's (1983) theoretical notion that coping with stress is indeed a fluid and dynamic process. In Part 1, several significant interactions with time emerged. To illustrate, I will focus on the most relevant aspects of the effects that were found. First, significant 3-way interactions between actor posttraumatic stress symptoms/actor earthquake-related ongoing earthquake stressors, sex, and time were revealed. Relationship quality decreased significantly over the 15 month study for men who experienced lower posttraumatic stress symptoms throughout the study, whereas it significantly declined for women who experienced higher symptoms (or more ongoing stressors). Second, significant 2-way interactions emerged between partner posttraumatic stress symptoms/partner trauma exposure and time. Of particular interest, relationship quality for individuals with partners who experienced higher symptoms significantly decreased over the study.

Further support was found in Part 2. To illustrate, I will focus on the most relevant aspects of the effects found. More specifically, two 4-way interactions emerged: one between actor posttraumatic stress symptoms, actor received support, sex, and time, and another between partner posttraumatic stress symptoms, partner received support, sex, and time. First, women who reported lower received support and higher posttraumatic stress symptoms over the study had declining relationship quality over time. In addition, relationship quality for women who experienced higher posttraumatic stress symptoms and reported higher support from their partners declined significantly over the study. Second, relationship quality for men with partners who experienced higher posttraumatic stress symptoms declined significantly over time. Furthermore, there was a 3-way interaction between actor posttraumatic stress

symptoms, partner reported support, and time, such that individuals with higher symptoms and partners who reported lower support had declining relationship quality over the study.

It is clear that actor/partner support moderation effects change over time. As mentioned previously, this is the only study applied to a trauma context that has examined such effects. Moreover, the stress literature generally does not examine these effects (see Thompson & Bolger, 1999 for an exception). Based on the current findings, studies that just investigate effects at one time point may inaccurately capture the impact of a traumatic/stressful event on relationship quality. For example, if the current study only examined effects at Time 1, it would appear that partner posttraumatic stress symptoms negatively affected relationship quality. However, the effect of partner posttraumatic stress symptoms on relationship quality was varied in that it positively impacted relationship quality at Time 4, therefore, it is important that future research takes a developmental perspective.

Sex Differences in Coping with Stress Exist. I did not derive or anticipate sex differences in the hypothesized effects in Part 1 and 2, given the dearth of research applied to natural disasters. However, a number of sex differences were found. Given that Part 2 built on Part 1's findings (i.e., the sex effects found in Part 1 were attributed to support exchanges, see the discussion in Chapter 2), I focus on these results. To illustrate, I will focus on the most relevant results (i.e., effects for actor/partner high posttraumatic stress symptoms).

First, the results suggest that although women cope with higher posttraumatic stress symptoms and low support better than men do, these efforts diminish over time. Women who reported lower received support and higher posttraumatic stress symptoms over the study had slightly higher relationship quality than men at Time 1. However, their relationship quality declined over time. On the other hand, men who reported the same support level and posttraumatic stress symptoms had stable relationship quality over time. However, higher levels of support did not protect women's relationship quality in the same way as it did for

men. Relationship quality for women who experienced *higher* posttraumatic stress symptoms and reported higher support from their partners declined significantly over the study, whereas it remained stable for men.

Second, it appeared that women were better at coping with their partner's high stress than men were. Relationship quality for women did not differ at Time 1 according to their level of posttraumatic stress symptoms when considering their level of reported support. However, the negative effect that partner posttraumatic stress symptoms had on men's relationship quality at Time 1 was buffered by their own reported levels of high partner support. Men with partners who experienced higher posttraumatic stress symptoms and received lower support from them had significantly lower relationship quality at Time 1. Furthermore, women appeared better at providing support to their partners when they (women) were stressed. Women with partners who experienced higher posttraumatic stress symptoms had slightly higher but relatively stable relationship quality when their partners also reported receiving higher support compared to when they reported lower support. Interestingly, men with partners who experienced higher posttraumatic stress symptoms and reported higher posttraumatic stress symptoms also had slightly higher relationship quality at Time 1, but it declined significantly over time, such that these men had lower relationship quality at Time 4 than those with partners who reported higher symptomology and lower partner support.

These effects may be explained by the fact that (a) women typically have a better support network than men and consequently rely on their spouses/partners less for support than men do (Cutrona, 1996), which would be a *temporary* benefit to them (given that support from a spouse/partner is particularly important and cannot be easily compensated for, Coyne & DeLongis, 1986) and (b) men are typically not as good at providing effective support to their spouses/partners in times of stress (Neff & Karney, 2005). If these

mechanisms are responsible for these effects, future interventions and preventions should aim to foster support networks for men in times of stress and aid men in providing *effective* (/responsive) support when their partner is stressed.

Strengths and Limitations

To the best of my knowledge, this is the first study that has quantitatively examined the impact that natural disaster-related stressors/stress have on relationship quality. It is also the first trauma context study to take a dyadic *and* developmental perspective using rigorous statistical analyses. Not only did the study examine how individuals' earthquake-related stressors/stress impacted their relationship quality (actor effects); it also examined how their partner's earthquake-related stressors/stress impacted their relationship quality (partner effects), while controlling for the former. In addition, the study examined whether these earthquake-related stressors/stress effects changed over time. The study is also unique in that it explored not only the impact of posttraumatic stress symptoms, but also the impact of the common earthquake-related stressors experienced postearthquake (i.e., loss of material resources, trauma exposure, and ongoing earthquake-related stressors). Finally, this study examined the role of an understudied posttrauma resource (or stressor more generally) – support exchanges within relationships. This was the first trauma (and stress more generally) context study to examine this resource using both a dyadic *and* developmental approach.

Despite these novelties and strengths, the study is not without limitations. First, given the characteristics of the sample, the generalizability of the results may be limited despite active attempts to recruit a representative Canterbury resident sample. Most of the participants were of New Zealand European descent, well-educated, and had a household income greater than $50,000. Moreover, the couples included in the study had fairly high relationship quality and support and low negative exchanges. This, however, is common within most of the trauma literature. For example, Hagedoorn et al. (2014) found that partners

who demonstrated interest in participating in research gave greater support to their cancer patient spouse than those who did not express interest. Moreover, patients reported greater marital satisfaction and distress. On a related note, the trauma impact experienced by the current sample was relatively low. This may explain why many of the measures were not significantly associated with relationship quality. However, it should also be noted that trauma impact in other postearthquake samples is similar to the current one. For example, Xu and Liao (2011) measured earthquake impact on a 0-9 scale, and 61% of the sample had an impact rating between 0 and 2. This earthquake was significantly more severe than the Christchurch earthquakes, resulting in 69,195 deaths and 18,392 missing persons. It is plausible that individuals who experience higher impact do not participate in research (particularly longitudinal research) given the numerous stressors that they are already facing in relation to the traumatic event. Future research should attempt to recruit and retain these understudied persons, although it is acknowledged that this will be a challenge.

Second, given the timing of the study (starting 14 months following the September 2010 earthquake and 8 months following the February 2011 earthquake), the results represent *chronic* postearthquake experiences. Thus, the results cannot be generalized to *acute* (or immediate) postearthquake experiences. Given that this study highlighted how effects can change over time, it is plausible that the way in which earthquake-related stressors/stress impacts relationship quality is different soon after the earthquake as opposed to several months after. Future research should assess both acute and chronic experiences posttrauma, although, it should be acknowledged that studying acute experiences may be difficult in the context of a natural disaster. Natural disasters are unpredictable, so researchers need to design the study, obtain funding, and ethical consent *post*disaster, all of which can take significant time. It was also the case in Christchurch that the government did not permit psychosocial research to be conducted until the state of emergency was lifted, some months after the

February event. Finally, it is of upmost importance that researchers are sensitive to the needs of the community. Given that the community is dealing with a significant trauma and other associated tasks (e.g., finding temporary accommodation), it might be impractical for them to participate in research immediately after a trauma.

Although the statistical analyses used in the current study have a unique advantage, enabling the researcher to examine whether effects change over time, the results are correlational and causality cannot be inferred. Indeed, potential confounding factors cannot be ruled out. For example, it cannot be inferred whether earthquake-related stress causes lower relationship quality or whether low relationship quality causes higher earthquake-related stress. An important avenue for future research is to infer causality of the effects found and pin down the causal mechanisms (i.e., adaptive processes, attributions) that are operating to produce certain effects. For example, the current study found that individuals with higher posttraumatic stress symptoms with partners who reported higher levels of support across the study had equivalent relationship quality compared to those with higher symptomology with partners who reported lower support at Time 1. However, individuals with higher symptoms and partners who reported lower support had declining relationship quality over the study, whereas those with partner's who reported higher support had stable relationship quality. I argued that attributions may account for this effect. More specifically, an individual may initially make allowances when they receive low levels of support from their partner when they (the partner) are experiencing high posttraumatic stress symptoms. However, as time passes and the event becomes less salient, individuals may find it more difficult to cope with partners who are *still* experiencing high symptomology, while *still* receiving low levels of support from them, ultimately resulting in lower relationship quality. Future research should determine whether this explanation (and the others offered throughout) is (are) accurate. On a related note, the current study focused on how the

experience of earthquake-related stressors and stress might be associated with relationship quality, however, other common posttrauma psychological reactions were not included, such as depression/depressive symptoms (cf. Bonanno et al., 2010; Neria & Galea, 2009). Posttraumatic stress symptoms and depressive symptoms are often experienced in conjunction postdisaster (cf. Bonanno et al., 2010). Given that posttraumatic stress symptoms and depressive symptoms are often comorbid one might wonder how these two psychological reactions are related and which has a more direct and a stronger influence on relationship quality. It is possible that the mechanism driving the posttraumatic stress symptom and relationship quality association are depressive symptoms. Indeed, depression is a known predictor of relationship quality and stability (e.g., Karney & Bradbury, 1995). Furthermore, Blow et al. (2013) found that depressive symptoms were a stronger predictor of relationship quality than posttraumatic stress symptoms (refer to Chapter 2 for more detail on the study). Future studies examining how the different emotional reactions posttrauma operate together to predict relationship quality are warranted so that we can further our knowledge of the mechanisms at play.

Finally, the measurement technique used was self-report, which is prone to retrospective bias and forgetting (Robinson & Clore, 2002), although, it is noteworthy that this is the favourable method in the trauma literature. Although future studies would benefit by using other methods, such as a diary study or video-taped interactions less prone to retrospective bias, this may not be practical postdisaster. It is particularly important that these methods be used with caution as it is important to not over-burden participants given they are already facing a number of other stressors in relation to the traumatic event.

Final Conclusion

The current four-wave study aimed to determine how the Canterbury earthquake-related stressors (i.e., loss of material resources, trauma exposure, and ongoing-earthquake

related stressors) and stress (i.e., posttraumatic stress symptoms) impacted individuals' intimate relationship quality by taking a dyadic and developmental perspective. Furthermore, the study investigated the role of a possible posttrauma resource available within the relationship – support exchanges – that might protect individuals' relationship quality during such adversity. The results indicate that, at Time 1, earthquake-related stress (posttraumatic stress symptoms, the strongest predictor) had a negative impact on relationship quality. However, for the large part, individuals' relationship quality was resilient in the face of the traumatic event. Indeed, individuals were protected from these effects if they had frequent support exchanges in the relationship. The effects found demonstrate the importance of taking a dyadic (i.e., considering both partner's experiences) and developmental (i.e., considering how the effects emerge across time) perspective. Indeed, the partner's experience is important when understanding how individuals' relationship quality is impacted by earthquake-related stressors/stress. Furthermore, these effects can change over time. Finally, the results suggest that although women can cope (as evidenced through better relationship quality) with higher symptoms and lower support better than men initially can, their efforts have diminishing effects over time. Furthermore, men are less able to cope with their partner's stress when they are not receiving frequent support. Future research should continue to take a dyadic and developmental perspective and efforts identifying the mechanisms responsible for these effects would be beneficial.

References

Aiken, L. S., & West, S. G. (1991). *Multiple regression: Testing and interpreting interactions*. London: Sage.

Alexander, P. C. (2014). Introduction to the special section on dual-trauma couples. *Psychological Trauma: Theory, Research, Practice, and Policy, 6,* 199-200.

Allen, E. S., Rhoades, G. K., Stanley, S. M., & Markman, H. J. (2010). Hitting home: Relationships between recent deployment, posttraumatic stress symptoms, and marital functioning for army couples. *Journal of Family Psychology, 24,* 280-288. doi: 10.1037/a0019405

Allen, E. S., Rhoades, G. K., Stanley, S. M., & Markman, H. J. (2011). On the home front: Stress for recently deployed army couples. *Family Process, 50,* 235-247.

American Psychiatric Association (Ed.). (1994). *Diagnostic and statistical manual of mental disorders: DSM-IV*. Washington DC: Author.

American Psychiatric Association (Ed.). (2000). *Diagnostic and statistical manual of mental disorders: DSM-IV-TR*. Washington DC: Author.

American Psychiatric Association (Ed.). (2013). *Diagnostic and statistical manual of mental disorders: DSM-5*. Washington DC: Author.

Anders, S. L., Shallcross, S. L., & Frazier, P. A. (2012). Beyond criterion A1: The effects of relational and non-relational traumatic events. *Journal of Trauma and Dissociation, 13,* 134-151. doi: 10.1080/15299732.2012.642744

Ardagh, M.W., Richardson, S.K., Robinson, V., Than, M., Gee, P., Henderson, S. ... Deely, J. M. (2012). The initial health-system response to the earthquake in Christchurch, New Zealand, in February, 2011. *The Lancet, 379,* 2109-2115. doi: 10.1016/S0140-6736(12)60313-4.

Arriaga, X. B. (2013). An Interdependence Theory analysis of close relationships. In J. A. Simpson & L. Campbell (Eds.). *The Oxford handbook of close relationships* (pp. 39-65). New York: Oxford University Press.

Beach, S. R. H., Martin, J. K., Blum, T. C., & Roman, P. M. (1993). Effects of marital and co-worker relationships on negative affect: Testing the central role of marriage. *The American Journal of Family Therapy, 21,* 313-323. doi: 10.1080/01926189308251002

Beck, J.G., Grant, D.M., Read, J.P., Clapp, J.D., Coffey, S.F., Miller, L.M. & Palyo, S.A. (2008). The Impact of Event Scale-Revised: Psychometric properties in a sample of motor vehicle accident survivors. *Anxiety Disorders, 22, 187-198.* doi:10.1016/j.janxdis.2007.02.007.

Belcher, A. J., Laurenceau, J-P., Siegel, S. D., Graber, E. C., Cohen, L. H., & Dasch, K. B. (2011). Daily support in couples coping with early stage breast cancer: Maintaining intimacy during adversity. *Health Psychology, 30,* 665-673.

Benight, C. C., Cieslak, R., & Waldrep, E. (2009). Social and cognitive frameworks for understanding mental health consequences of disasters. In Y. Neria, S. Galea, & F. H. Norris (Eds.). *Mental Health and Disasters* (pp. 161-174). New York: Cambridge University Press.

Bergmann, J. S., Renshaw, K. D., Allen, E. S., Markman, H. J., & Stanley, S. M. (2014). Meaningfulness of service and marital satisfaction in army couples. *Journal of Family Psychology.* (early access online) http://dx.doi.org/10.1037/fam0000013.

Bishop, M., Beaumont, J. L., Hahn, E. A., Cella, D., Andrykowski, M. A., Brady, M. J….Wingard, J. R. (2007). Late effects of cancer and hematopietic stem-cell transplantation on spouses or partners compared with survivors and survivor-matched

controls. *Journal of Clinical Oncology, 25,* 1403-1411. doi: 10.1200/JCO.2006.07.5705

Blow, A. J., Gorman, L., Ganoczy, D., Kees, M., Kashy, D., Valenstein, M.…Chermack, S. (2013). Hazardous drinking and family functioning in National Guard veterans and spouses postdeployment. *Journal of Family Psychology, 27,* 303-313. doi: 10.1037/a0031881

Bonanno, G. A. (2004). Loss, trauma, and human resilience: Have we underestimated the human capacity to thrive after extremely aversive events? *American Psychologist, 59,* 20-28. doi: 10.1037/0003-066X.59.1.20

Bonanno, G. A., Brewin, C. R., Kaniasty, K., & La Greca, A. M. (2010). Weighing the costs of disaster: Consequences, risks, and resilience in individuals, families, and communities. *Psychological Science in the Public Interest, 11,* 1-49. doi: 10.1177/1529100610387086.

Bonanno, G. A., & A. D., Mancini (2012). Beyond resilience and PTSD: Mapping the heterogeneity of responses to potential trauma. *Psychological Trauma: Theory, Research, Practice, and Policy, 4,* 74-83. doi: 10.1037/a0017829

Bradbury, T. N., & Karney, B. R. (2013). *Intimate Relationships* (2nd ed.). Canada: W. W. Norton & Company.

Bradbury, T. N., & Fincham, F. D. (1990). Attributions in marriage: Review and Critique. *Psychological Bulletin, 107,* 3-33.

Bradbury, T. N., Fincham, F. D., & Beach, S. R. H. (2000). Research on the nature and determinants of marital satisfaction: A decade in review. *Journal of Marriage and Family, 62,* 964-980.

Brewin, C. R., Andrews, B., & Valentine, J. D. (2000). Meta-analysis of risk factors for posttraumatic stress disorder in trauma-exposed adults. *Journal of Consulting and Clinical Psychology, 68,* 748–766. doi: 10.1037/0022-006X.68.5.748

Briere, J., & Elliott, D. (2000). Prevalence, characteristics, and long-term sequelae of natural disaster exposure in the general population. *Journal of Traumatic Stress, 13,* 661-679.

Bridges, K. R., Sanderman, R., & van Sonderen, E. (2002). An English language version of the social support list: Preliminary reliability. *Psychological Reports, 90,* 1055–1058.

Broman, C. L., Riba, M. L., & Trahan, M. R. (1996). Traumatic events and marital well-being. *Journal of Marriage and Family, 58,* 908-916.

Burridge, A. C., Williams, W. H., Yates, P. J., Harris, A., & Ward, C. (2007). Spousal relationship satisfaction following acquired brain injury: The role of insight and socio-emotional skill. *Neuropsychological Rehabilitation, 17,* 95-105. doi: 10.1080/09602010500505070

Campbell, S. B., & Renshaw, K. D. (2012). Distress in spouses of Vietnam veterans: Associations with communication about deployment experiences. *Journal of Family Psychology, 26,* 18-25. doi: 10.1037/a0026680

Campbell, S. B., & Renshaw, K. D. (2013). PTSD symptoms, disclosure, and relationship distress: Explorations of mediation and associations over time. *Journal of Anxiety Disorders, 27,* 494-502.

CERA. (2011). Latest Christchurch land information released. Retrieved from http://cera.govt.nz/news/latest-christchurch-land-information-released-23-june-2011

Cigrang, J. A., Talcott, G. W., Tatum, J., Baker, M., Cassidy, D., Sonnek, S….Slep, A. M. (2014). Impact of combat deployment on psychological and relationship health: A longitudinal study. *Journal of Traumatic Stress, 27,* 58-65. doi: 10.1002/jts.21890

Cohan, C. L., & Cole, S. W. (2002). Life course transitions and natural disaster: Marriage, birth, and divorce following Hurricane Hugo. *Journal of Family Psychology, 16,* 14-25. doi: 10.1037//0893-3200.16.16.14

Cohen, J. (1988). *Statistical power analysis for the behavioral sciences* (2nd ed.). Hillsdale, NJ: Erlbaum.

Cohen, S., & Wills, T. A. (1985). Stress, social support, and the buffering hypothesis. *Psychological Bulletin, 98,* 310-357.

Coyne, J. C., & DeLongis, A. (1986). Going beyond social support: The role of social relationships in adaptation. *Journal of Consulting and Clinical Psychology, 54,* 454-460.

Coyne, J. C., & Smith, D. A. (1991). Couples coping with a Myocardial Infarction: A contextual perspective on wives' distress. *Journal of Personality and Social Psychology, 61,* 404-412.

Coyne, J. C., Rohrbaugh, M. J., Shoham, V., Sonnega, J. S., Nicklas, J. M., & Cranford, J. A. (2001). Prognostic importance of marital quality for survival of congestive heart failure. *The American Journal of Cardiology, 88,* 526-529.

Creamer, M., Bell, & Failla, S. (2003). Psychometric properties of the Impact of Event-Scale Revised. *Behaviour Research and Therapy, 41,* 1489-1496. doi:10.1016/j.brat.2003.07.010.

Cutrona, C. E. (1996). *Social support in marriage.* Thousand Oaks, CA: Sage.

Cutrona, C. E., Russell, D. W., & Gardner, K. A. (2005). The relationship enhancement model of social support. In T. A. Revenson, K. Kayser, & Bodenmann, G. (Eds.). *Couples coping with stress: Emerging perspectives on dyadic coping. Decade of behaviour* (pp. 73-95). Washington DC: American Psychological Association.

Dekel, R., Enoch, G., & Solomon, Z. (2008). The contribution of captivity and posttraumatic stress disorder to marital adjustment of Israeli couples. *Journal of Social and Personal Relationships, 25.* doi: 10.1177.0265407508090870

Dekel, R., & Monson, C. M. (2010). Military-related post-traumatic stress disorder and family relations: Current knowledge and future directions. *Aggression and Violent Behavior, 15,* 303-309. doi: 10.1016/j.avb.2010.03.001

DiLillo, D., & Long, P. J. (1999). Perceptions of couple functioning among female survivors of child sexual abuse. *Journal of Child Sexual Abuse, 7,* 59-76. doi: 10.1037/AJ022-006X.69.6.1048

Dorahy, M. J., & Kannis-Dymand, L. (2012). Psychological distress following the 2010 Christchurch earthquake: A community assessment of two differentially affected suburbs. *Journal of Loss and Trauma, 17,* 203-217. doi: 10.1080/15325024.2011.616737

Erbes, C. R., Meis, L. A., Polusny, M. A., & Compton, J. S. (2011). Couple adjustment and posttraumatic stress disorder symptoms in National Guard veterans of the Iraq war. *Journal of Family Psychology, 25,* 479-487. doi: 10.1037/a0024007

Fergusson, D. M., Horwood, J., Boden, J. M., & Mulder, R. T. (2014). Impact of a major disaster on the mental health of a well-studied cohort. *JAMA Psychiatry, 71,* 1025-1031. doi: 10.1001/jamapsychiatry.2014.652

Fincham, F. D., & Bradbury, T. N. (1993). Marital satisfaction, depression, and attributions: A longitudinal analysis. *Journal of Personality and Social Psychology, 3,* 442-452.

Fincham, F. D., Harold, G. T., & Gano-Phillips, S. (2000). The longitudinal associations between attributions and marital satisfaction: Direction of effects and role of efficacy expectations. *Journal of Family Psychology, 14,* 267-285.

Fletcher, G. J. O., Simpson, J., & Thomas, G. (2000). The measurement of relationship quality components: A confirmatory factor analytic study. *Personality and Social Psychology Bulletin, 26,* 340-354.

Fredman, S. J., Monson, C. M., Schumm, J. A., Adair, K. C., Taft, C. T., & Resick, P. A. (2010). Associations among disaster exposure, intimate relationship adjustment, and PTSD symptoms: Can disaster exposure enhance a relationship? *Journal of Traumatic Stress, 23,* 446-451.

Galea, S., Nandi, A., & Vlahov, D. (2005). The epidemiology of posttraumatic stress disorder after disasters. *Epidemiologic Reviews, 27,* 78-91. doi: 10.1093/epirev/mxi003

GNS Science. (2014). *Earthquake Catalogue*. Retrieved from http://info.geonet.org.nz/display/appdata/Earthquake+Catalogue.

Gewirtz, A. H., Polusny, M. A., DeGarmo, D. S., Khaylis, A., & Erbes, C. R. (2010). Posttraumatic stress symptoms among National Guard soldiers deployed to Iraq: Associations with parenting behaviors and couple adjustment. *Journal of Consulting and Clinical Psychology, 78,* 599-610. doi: 10.1037/a0020571

Godbout, N., Lussier, Y., & Sabourin, S. (2006). Early abuse experiences and subsequent gender differences in couple adjustment. *Violence and Victims, 21,* 744-760.

Gottman, J. M. (1994). *What predicts divorce?* Hillsdale, NJ: Erlbaum.

Gottman, J. M., & Notarius, C. I. (2000). Decade review: Observing marital interaction. *Journal of Marriage and the Family, 62,* 927-947.

Graham, J. M., & Barnow, Z. B. (2013). Stress and social support in gay, lesbian, and heterosexual couples: Direct effects and buffering models. *Journal of Family Psychology, 27,* 569-578. doi: 10.1037/a0033420

Hagedoorn, M., Dagan, M., Puterman, E., Hoff, C., Meijerink, J., DeLongis, A., & Sanderman, R. (2011). Relationship satisfaction in couples confronted with colorectal

cancer: The interplay of past and current spousal support. *Journal of Behavioral Medicine, 34,* 288-297. doi: 10.1007/s10865-010-9311-7

Hagedoorn, M., Sanderman, R., Coyne, C., Bolks, H. N., & Tuinstra, J. (2008). Distress in couples coping with cancer: A meta-analysis and critical review of role and gender effects. *Psychological Bulletin, 134,* 1-30. doi: 10.1037/0033-2909.134.1.1

Hagedoorn, M., Hein, F. L., Schulz, T., Homan van der Heide, J. J., Niesing, J., Westerhuis, R. … Ranchor, A. V. (2014). Are patient and relationship variables associated with participation of intimate partners in couples research? *Health Psychology* (early access online) http://dx.doi.org/10.1037/hea0000141.

Hagedoorn, M., Kuijer, R. G., Wobbes, T., Buunk, B. P., DeJong, G. M., & Sanderman, R. (2000). Marital satisfaction in patients with cancer: Does support from intimate partners benefit those who need it the most? *Health Psychology, 19,* 274-282. doi: 10.1037/0278-6133.19.3.274

Heider, F. (1958). *The Psychology of Interpersonal Relations.* New York: Wiley.

Hendrick, S. (1988). A generic measure of relationship satisfaction. *Journal of Marriage and Family, 50,* 93-98.

Hinnen, C., Hagedoorn, M., Ranchor, A. V., & Sanderman, R. (2008). Relationship satisfaction in women: A longitudinal case-control study about the role of breast cancer, personal assertiveness, and partners' relationship focused coping. *British Journal of Health Psychology, 13,* 737-754. doi: 10.1348/135910707X252431

Hobfoll, S. E. (1989). Conservation of resources: A new attempt at conceptualizing stress. *American Psychologist, 44,* 513-524.

Hobfoll, S. E., (1991). Traumatic stress: A theory based on rapid loss of resources. *Anxiety Research, 4,* 187-197.

Iida, M., Parris Stephens, M. A., Rook, K. S., Franks, M. M., & Salem, J. K. (2010). When the going gets tough, does support get going? Determinants of spousal support provision to Type 2 Diabetic Patients. *Personality and Social Psychological Bulletin, 36,* 780-791. doi: 10.1177/014616210369897

Jordan, B. K., Marmar, C. R., Fairbank, J. A., Schlenger, W. E., Kulka, R. A., Hough, R. L., & Weiss, D. S. (1992). Problems in families of male Vietnam veterans with posttraumatic stress disorder. *Journal of Consulting and Clinical Psychology, 60,* 916-925.

Kaniasty, K., & Norris, F. H. (1995). In search of altruistic community: Patterns of social support mobilization following Hurricane Hugo. *American Journal of Community Psychology, 23,* 447-477.

Kanner, A.D., Coyne, J.C., Schaefer, C., & Lazarus, R.S. (1981). Comparison of two modes of stress measurement: Daily hassles and uplifts versus major life events. *Journal of Behavioral Medicine, 4,* 1-39.

Karney, B. R., & Bradbury, T. N. (1995). The longitudinal course of marital quality and stability: A review of theory, method, and research. *Psychological Bulletin, 118,* 3-34.

Karney, B. R., & Neff, L. A. (2013). Couples and stress: How demands outside a relationship affect intimacy within the relationship. In J. A. Simpson & L. Campbell (Eds.). The Oxford handbook of close relationships (pp. 664-684). New York: Oxford University Press.

Kashy, D. A., & Donnellan, M. B. (2008). Comparing MLM and SEM approaches to analyzing developmental dyadic data: Growth curve models of hostility in families. In N. A. Card, J. P. Selig, & T. D. Little (Eds.), *Modeling dyadic and interdependent data in the developmental and behavioral sciences* (pp. 165-190). New York: Routledge.

Kelley, H. H., & Thibaut, J. W. (1978). *Interpersonal relations: A theory of interdependence.* New York: Wiley.

Kenny, D. A., (1996). Models of non-independence in dyadic research. *Journal of Social and Personal Relationships, 13,* 279 – 294. doi: 10.1177/0265407596132007.

Kenny, D. A., Kashy, D. A., & Cook, W. L. (2006). *Dyadic Data Analysis.* New York: The Gilford Press.

Khaylis, A., Polusny, M. A., Erbes, C. R., Gewirtz, A., Rath, M. (2011). Posttraumatic stress, family adjustment, and treatment preferences among National Guard soldiers deployed to OEF/OIF. *Military Medicine, 176,* 126-131.

Klaric, M., Franciskovic, T., Stevanovic, A., Petrov, B., Jonovska, S., & Moro, I. N. (2011). Marital quality and relationship satisfaction in war veterans and their wives in Bosnia and Herzegovina. *European Journal of Psychotraumatology, 2,* 8077-8084. doi: 10.3402/ejpt.v2i0.8077

Kleiboer, A.M., Kuijer, R.G., Hox, J.J., Schreurs, K.M.G. & Bensing, J. (2006). Receiving and providing support in couples dealing with multiple sclerosis: A diary study using an equity perspective. *Personal Relationships, 13,* 485-501.

Knoll, N., Burkert, S., Krammer, J., Roigas, J., & Gralla, O. (2009). Relationship satisfaction and erectile functions in men receiving laparoscopic radical prostatectomy: Effects of provision and receipt of spousal social support. *Journal of Sexual Medicine, 6,* 1438-1450.

Kuijer, K. G., Marshall, E. M., & Bishop, A. N. (2014). Prospective predictors of short-term adjustment after the Canterbury earthquakes: Personality and depression. *Psychological Trauma: Theory, Research, Practice, and Policy, 6,* 361-369.

Kuijer, R. (2009). Justice norms applied to relationships. In Harry T. Reis & Susan Sprecher (Eds.), *Encyclopaedia of Human Relationships* (pp. 944-947). Thousand Oaks, CA: Sage.

Kuijer, R.G., Buunk, B. P. and Ybema, J. F. (2001) Are equity concerns important in the intimate relationship when one partner of a couple has cancer? *Social Psychology Quarterly* 64: 267- 282.

Kuijer, R. G., Ybema, J. F., Buunk, B. P., DeJong, M., Thijs-Boer, F., & Sanderman, R. (2000). Active engagement, protective buffering, and overprotection: Three ways of giving support by intimate partners of patients with cancer. *Journal of Social and Clinical Psychology, 19,* 256-275.

Kuijer, R. G., Buunk, B. P., Ybema, J. F., & Wobbes, T. (2002). The relation between perceived inequity, marital satisfaction, and emotions among couples facing cancer. *British Journal of Social Psychology, 41,* 39-56.

Krause, N. (1995). Negative interaction and satisfaction with social support among older adults. *Journals of Gerontology, Series B: Psychological Sciences and Social Sciences, 50,* P59–P73.

Lakey, B. (2013). Social support processes in relationships. In J. A. Simpson & L. Campbell (Eds.). The Oxford handbook of close relationships (pp. 711-728). New York: Oxford University Press.

Lambert, J. E., Engh, R., Hasbun, A., & Holzer, J. (2012). Impact of posttraumatic stress disorder on the relationship quality and psychological distress of intimate partner: A meta-analytic review. *Journal of Family Psychology, 26,* 729-737. doi: 10.1037/a0029341

Lazarus, R. S. & Folkman, S. (1984). *Stress, appraisal, and coping.* New York: Springer.

Lazarus, R. S. (1966). *Psychological Stress and the Coping Process*. New York: McGraw-Hill.

Lowe, S. R., Rhodes, J. E., & Scoglio, A. A. (2012). Changes in marital and partner relationships in the aftermath of Hurricane Katrina: An analysis with low-income women. *Psychology of Women Quarterly, 36,* 286-300. doi: 10.1177/0361684311434307

Marshall, E.M., Frazier, P., Frankfurt, S., & Kuijer, R.G. (2014). Trajectories of Posttraumatic Growth and Depreciation after Two Major Earthquakes. *Psychological Trauma: Theory, Research and Policy* (early access online) http://dx.doi.org/10.1037/tra0000005.

McColl, G. J., & Burkle, F. M. (2012). The new normal: Twelve months of resiliency and recovery in Christchurch, *Disaster Medicine and Public Health Preparedness, 6,* 33-43.

McCubbin, H. I., & Patterson, J. M. (1983). The family stress process. *Marriage and Family Review, 6,* 7-37.

McMillen, C. J., Smith, E. M., & Fisher, R. H. (1997). Perceived benefit and mental health after three types of disaster. *Journal of Consulting and Clinical Psychology, 65,* 733-739.

Meis, L. A., Erbes, C. R., Polusny, M. A., & Compton, J. S. (2010). Intimate relationships among returning soldiers: The mediating and moderating roles of negative emotionality, PTSD symptoms, and alcohol problems. *Journal of Traumatic Stress, 23*, 564-572. doi: 10.1002/jts.20560

Mo T., H., Gritz, E. R., Wellisch, D. K., Fobair, P., Hoppe, R. T., Bloom, J. R….Spiegel, D. (1992). Changes in marital and sexual functioning in long-term survivors and their spouses: Testicular cancer versus Hodgkin's Disease. *Psycho-oncology, 1,* 89-103.

Monk, J. K., & Nelson Goff, B. S. (2014). Military couples' trauma disclosure: Moderating between trauma symptoms and relationship quality. *Psychological Trauma: Theory, Research, Practice, and Policy, 6,* 537-545.

Monson, C. M., Gradus, J. L., LaBash, H. A. J., Griffin, M. G., & Resick, P. A. (2009). The role of couples' interacting world assumptions and relationship adjustment in women's postdisaster PTSD symptoms. *Journal of Traumatic Stress, 22,* 276-281. doi: 10.1002/jts.20432

Mooney, M. F., Paton, D., de Terte, I., Johal, S., Karanci, A. N., Gardner, D., Collins, S., … Johnston, D. M. (2011). Psychosocial recovery from disasters: A framework informed by evidence. *New Zealand Journal of Psychology, 40,* 26–38.

Neff, L. A., & Karney, B. R. (2005). Gender differences in social support: A question of skill or responsiveness. *Journal of Personality and Social Psychology, 88,* 79-90. doi: 10.1037/0022-3514.88.1.79

Neff, L. A., & Karney, B. R. (2007). Stress crossover in newlywed marriage: A longitudinal and dyadic perspective. *Journal of Marriage and Family, 69,* 594-607.

Nelson Goff, B. S., & Smith, D. B. (2005). Systematic traumatic stress: The couple adaption to traumatic stress model. *Journal of Marital and Family Therapy, 31,* 145-157.

Nelson Goff, B., Crow, J. R., Reisbig, A. M. J., & Hamilton, S. (2007). The impact of individual trauma symptoms of deployed soldiers on relationship satisfaction. *Journal of Family Psychology, 21,* 344-353. doi: 10.1037/0893-3200.21.3.344

Nelson Goff, B. S., Irwin, L., Cox, M., Devine, S., Summers, K., & Schmitz, A. (2014). A qualitative study of single-trauma and dual-trauma military couples. *Psychological Trauma: Theory, Research, Practice, and Policy, 6,* 216-223.

Neria, Y., Galea, S., & Norris, F. H. (2009). *Mental Health and Disasters*. New York: Cambridge University Press.

Neria, Y., Nandi, A., & Galea, S. (2008). Post-traumatic stress disorder following disasters: A systematic review. *Psychological Medicine, 38,* 46 -480. doi: 10.1017/S0033291707001353.

Nolen-Hoeksema & Morrow, J. (1991). A prospective study of depression and posttraumatic stress symptoms after a natural disaster: The 1989 Loma Prieta earthquake. *Journal of Personality and Social Psychology, 61,* 115-121. doi: 10.1037/0022-3514.61.1.115

Norris, F. H. & Wind, L. H. (2009). The experience of disaster: trauma, loss, adversities, and community effects. In Y. Neria, S. Galea, & F. H. Norris (Eds.). *Mental Health and Disasters* (pp. 29-46). New York: Cambridge University Press.

Norris, F. H., Friedman, M. J., Watson, P. J., Byrne, C. M., Diaz, E., & Kaniasty, K. (2002). 60,000 disaster victims speak: Part 1. An empirical review of the empirical literature, 1981 – 2001. *Psychiatry, 65,* 207- 239.

Norris, F. H., Tracy, M., & Galea, S. (2009). Looking for resilience: Understanding the longitudinal trajectories of responses to stress. *Social Science & Medicine, 68,* 2190-2198. doi: 10.1016/j.socscimed.2009.03.043.

Ozer, E., Best, S., Lipsey, T., & Weiss, D. (2003). Predictors of posttraumatic stress disorder and symptoms in adults: A meta-analysis. *Psychological Bulletin, 129,* 52–73. doi: 10.1037/0033-2909.129.1.52

Parker, M., & Steenkamp, M. P. (2012). The economic impact of the Canterbury earthquakes. *Reserve Bank of New Zealand Bulletin, 75,* 13-25. Retrieved from http://www.rbnz.govt.nz/research_and_publications/reserve_bank_bulletin/2012/2012sep75_3parkersteenkamp.pdf

Pasch, L. A., & Bradbury, T. N. (1998). Social support, conflict, and the development of marital dysfunction. *Journal of Consulting and Clinical Psychology, 66,* 219-230.

Ptacek, J. T., Smith, R. E., & Dodge, K. L. (1994). Gender differences in coping with stress: When stressor and appraisals do not differ. *Personality and Social Psychology Bulletin, 20,* 421-430.

Raftery, A. (1995). Bayesian model selection in social research (A discussion with Andrew Gelman & Donald B. Rubin, and Robert M. Hauser, and a Rejoinder). In P.V. Marsden (Ed.). *Sociological Methods* (pp. 185-195). Cambridge, Mass: Blackwell.

Regan, T. W., Lambert, S. D., Kelly, B., McElduff, P., Girgis, A., Kayser, K., & Turner, J. (2014). Cross-sectional relationships between dyadic coping and anxiety, depression, and relationship satisfaction for patients with prostate cancer and their spouses. *Patient Education and Counseling, 96,* 120-127.

Reis, H. T., & Clark, M. S. (2013). Responsiveness. In J. A. Simpson & L. Campbell (Eds.). *The Oxford handbook of close relationships* (pp. 400-426). New York: Oxford University Press.

Reizer, A., Possick, C., & Ein-Dor, T. (2010). Environmental threat influences psychological distress and marital satisfaction among avoidantly attached individuals. *Personal Relationships, 17,* 585-598. doi: 10.1111/j.1475-6811.2010.01301.x

Renshaw, K. D., & Campbell, S. B. (2011). Combat veterans' symptoms of PTSD and partners' distress: The role of partners' perceptions of veterans' deployment experiences. *Journal of Family Psychology, 25,* 953-962. doi: 10.1037/a0025871

Renshaw, K. D., Rodrigues, C., & Jones, D. H. (2008). Psychological symptoms and marital satisfaction in spouses of operation Iraqi Freedom Veterans: Relationships with spouses' perceptions of veterans' experiences and symptoms. *Journal of Family Psychology, 22,* 586-594. doi: 10.1037/0893-3200-22.3.586

Robinson, M.D., & Clore, G.L. (2002). Belief and feeling: Evidence for an accessibility model of emotional self-report. *Psychological Bulletin, 128,* 934–960. doi: 10.1037//0033-2909.128.6.934

Sanford, K. (2014). A latent change score model of conflict resolution in couples: Are negative behaviors bad, benign, or beneficial? *Journal of Social and Personal Relationships, 31,* 1068-1088. doi: 10.1177/0265407513518156

Sattler, D. N., de Alvarado, A. M. G., de Castro, N. B., Van Male, R., Zetino, A. M., & Vega, R. (2006). El Salvador earthquakes: Relationships among acute stress disorder symptoms, depression, traumatic event exposure, and resource loss. *Journal of Traumatic Stress, 19,* 879-893. doi: 10.1002/jts.20174.

Schokker, M. C., Stuive, I., Bouma, J., Keers, J. C., Links, T. P., Wolffenbuttel, B. H. R. … Hagedoorn, M. (2010). Support behavior and relationship satisfaction in couples with diabetes: Main and moderating effects. *Journal of Family Psychology, 24,* 578-586. doi: 10.1037/a0021009

Shumaker, S. A., & Hill, D. R. (1991). Gender differences in social support and physical health. *Health Psychology, 10,* 102-111.

Singer, J. D., & Willett, J. B. (2003). *Applied longitudinal data analysis: Modeling change and event occurrence.* New York: Oxford University Press.

Spanier, G. B. (1976). Measuring dyadic adjustment: New scales for the assessing the quality of marriage and similar dyads. *Journal of Marriage and Family, 38,* 15-28.

Statistics New Zealand. (2013). *2013 Census QuickStats about national highlights.* Retrieved from http://www.ccc.govt.nz/cityleisure/statsfacts/census/agegenderethnicity.aspx

Stuff and NZPA. (2011). Retrieved from http://www.stuff.co.nz/national/4689353/Christchurch-quake-Eyewitness-accounts

Sullivan, K. T., Pasch, L. A., Eldridge, A., & Bradbury, T. N. (1998). Social support in marriage: Translating research into practical applications for clinicians. *The Family Journal, 6,* 263-271.

Sullivan, K. T., Pasch, L. A., Johnson, M. D., & Bradbury, T. N. (2010). Social support, problem solving, and the longitudinal course of newlywed marriage. *Journal of Personality and Social Psychology, 98,* 631-644. doi: 10.1037/a0017578

Sveen, J., Low, A., Dyster-Aas., J., Ekselius, L., Willebrand, M., & Gerdin, B. (2010). Validation of a Swedish version of the Impact if Event Scale-Revised (IES-R) in patients with burns. *Journal of Anxiety Disorders, 24*, 618-622. doi:10.1016/j.janxdis.2010.03.021

Taft, C. T., Monson, C. M., Schumm, J. A., Watkins, L. E., Panuzio, J., & Resick, P. A. (2009). Posttraumatic stress disorder symptoms, relationship adjustment, and relationship aggression in a sample of female flood victims. *Journal of Family Violence, 24,* 389-396. doi: 10.1007/s10896-009-9241-8

Taft, C. T., Watkins, L. E., Stafford, J., Street, A. E., & Monson, C. M. (2011). Posttraumatic stress disorder and intimate relationship problems: A meta-analysis. *Journal of Consulting and Clinical Psychology, 79,* 22-33. doi: 10.1037/a0022196

Tesser, A., & Beach, S. R. H. (1998). Life events, relationship quality, and depression. An investigation of judgment discontinuity in vivo. *Journal of Personality and Social Psychology, 74,* 36-52.

Thibaut, J. W., & Kelley H. H. (1959). *The social psychology of groups.* New York: Wiley.

Thompson, A., & Bolger, N. (1999). Emotional transmission in couples under stress. *Journal of Marriage and the Family, 61,* 38-48.

Tuinman, M. A., Fleer, J., Sleijfer, D. T., Hoekstra, H. J., & Hoekstra-Weebers, J. E. H. M. (2005). Marital and sexual satisfaction in testicular cancer survivors and their spouses. *Support Care Cancer, 13,* 540-548. doi: 10.1007/s00520-004-0758-3

Turner, R. J., & Marino, F. (1994). Social support and social structure: A descriptive epidemiology. *Journal of Health and Social Behavior, 35,* 193-212.

Tyler, K. A. (2006). The impact of support received and support provision on changes in perceived social support among older adults. *International Journal of Aging and Human Development, 62,* 21-38.

Vrana, S., & Lauterbach, D. (1994). Prevalence of traumatic events and post-traumatic psychological symptoms in a nonclinical sample of college students. *Journal of Traumatic Stress, 7,* 289-302.

Watts, K. J., Sherman, K. A., Mireskandari, S., Meiser, B., Taylor, A., & Tucker, K. (2011). Predictors of relationship adjustment among couples coping with a high risk of developing breast/ovarian cancer. *Psychology & Health, 26,* 21-39. doi: 10.1080/08870441003592587

Weiss, D. S., & Marmar, C. R. (1997). The Impact of Event Scale-Revised. In J. P. Wilson, & T. M. Keane (Eds.), *Assessing psychological trauma and PTSD: A handbook for practitioners* (pp. 399-411). New York: Guilford Press.

Whisman, M. A. (2006). Childhood trauma and marital outcomes in adulthood. *Personal Relationships, 13,* 375-386.

White P., Gunston J., Salmond C., Atkinson J.**,** Crampton P. (2008). *Atlas of Socioeconomic Deprivation in New Zealand NZDep2006*. Wellington: Ministry of Health.

Xu, J., & Liao, Q. (2011). Prevalence and predictors of posttraumatic growth among adult survivors one year following 2008 Sichuan earthquake. *Journal of Affective Disorders, 133,* 274-280.

Zerach, G., Anat, B., Solomon, Z., & Heruti, R. (2010). Posttraumatic symptoms, marital intimacy, dyadic adjustment, and sexual satisfaction among ex-prisoners of war. *Journal of Sexual Medicine, 7,* 2739-2749. doi: 10.1111/j.1743-6109.2010.01784.x

Appendix 1

UNIVERSITY OF CANTERBURY
Te Whare Wānanga o Waitaha
CHRISTCHURCH NEW ZEALAND

HUMAN ETHICS COMMITTEE

Secretary, Lynda Griffioen
Email: human-ethics@canterbury.ac.nz

Ref: HEC 2011/61

15 August 2011

Emma Marshall
Department of Psychology
UNIVERSITY OF CANTERBURY

Dear Emma

The Human Ethics Committee advises that your research proposal "The impact of the Christchurch earthquake on couples" has been considered and approved.

Please note that this approval is subject to the incorporation of the amendments you have provided in your email of 11 August 2011.

Best wishes for your project.

Yours sincerely

Michael Grimshaw
Chair
University of Canterbury Human Ethics Committee

Appendix 2

An example of the Information Sheet and Consent Form Provided in Time 0 – Time 4 questionnaires (note: formatting is not identical to online questionnaire lay out).

UNIVERSITY OF CANTERBURY
Te Whare Wānanga o Waitaha
CHRISTCHURCH NEW ZEALAND

The Impact of the Christchurch Earthquakes on Couples:
Female Partners' Questionnaire

Dear Participant,

Welcome to the first part of the questionnaire study. Thank you very much for agreeing to participate in this study. Your contributions are much appreciated.

About this questionnaire:

As you know, the aim of this study is to document the impact of the Canterbury earthquakes on residents' well-being and how they have impacted couples and the quality of their relationship. This questionnaire consists of 8 sections that will help us fulfill this aim. The sections are as follows:

1. Background Information
2. Earthquake Experiences
3. Health and Well-being
4. Daily Hassles
5. Past and Present Close Relationships
6. Communication with your Partner
7. Agreement with your Partner
8. Support between you and your Partner

This questionnaire should take between 30 minutes and 45 minutes to complete. It is recommended that you and your partner complete the questionnaire separately and do not discuss it until after it is completed and sent away. As a token of our appreciation, you will receive a $10 voucher once we have received the completed questionnaire from you. At the end of the questionnaire you can indicate whether you would like to receive a $10 Petrol voucher or a $10 Westfield voucher. In addition to this, all couples who complete this questionnaire and the 3 others that follow will go into a draw to win a $500 voucher of their choice. It is possible that the self-assessment required in this study may lead to distress/stress. If at any time during participation in this study you experience distress of any

kind and want to talk to someone about your experience, please consult with your GP or refer to support providers list supplied at the end of this questionnaire.

What happens to the information you provide?

The information that you provide will be completely confidential. The participant ID number provides us the ability to identify you and your partner as a couple, but does not provide any further detail. You have the opportunity to withdraw from participating in this study at any time. If you no longer want to be a part of this study, please do not fill in or return this questionnaire.

What is coming next in this study?

As mentioned this is part one (of four) that forms the questionnaire study. The part two will be sent to you in March 2012. If you have shown interest in doing the diary questionnaire, this will be mailed to you once you finish this questionnaire. For those of you who have not shown interest in this aspect of this research project, but are wondering if you would like to do it now, contact us for further details.

Questions/Comments: If you have any questions or comments we are more than happy to listen and help where needed. You can contact Emma Marshall on (03) 366 7001 extension 3406 or Dr Roeline Kuijer on extension 3401. Alternatively, you can email us at emma.marshall@pg.canterbury.ac.nz or at roeline.kuijer@canterbury.ac.nz.

Once again, thank you for your contribution.

Kind Regards,

Emma Marshall and Dr Roeline Kuijer

Consent Form

I have read an understood the description of the study entitled "The Impact of the Christchurch Earthquakes on Couples." On this basis I agree to participate, and I consent to the publication of the results of this study with the understanding that confidentiality will be preserved. I understand also that I may at any time withdraw from the study, including withdrawal of any information that I have provided.

I (write full name in the box provided) consent to participate in the following study

_____

Write today's date in the box provided (DD/MM/YYYY) _____

An example of the final section used in Time 0 – Time 4.

You have reached the end of the questionnaire.
Thank you very much for participating.

Voucher

Would you like to receive a $10 Westfield voucher or a $10 Petrol voucher? We will send this voucher by post.

- ❍ $10 Westfield Voucher
- ❍ $10 Petrol Voucher

If you want this sent to a different postal address to the one this questionnaire was sent to please write the preferred postal address? (note: this information will be stored separately to the main questionnaire).

Street_____

Suburb_____

City_____

Postal Code _____

Results

Would you like to receive a summary of the results when this study is completed? This is likely to occur after February 2013.

- ❍ Yes
- ❍ No

Support Providers: A Contact List

Relationship Services:
This is a place that provides personal, relationship and family counselling.
Phone: (03) 366 8804
Address: 140A Linwood Ave. PO Box 1018. Christchurch, 8140
Email: christchurch@relationships.org.nz
Website: http://www.relate.org.nz
Lifeline:
A 24 hour counselling service. Phone: 0800 543 354
Parent Help Line – Barnados:
Phone: 0800 4 PARENT (0800 472 736)
Parentline:
Phone: 0800 OK PARENT (0800 657 273)
Healthline:
Phone: 0800 611 11

Appendix 3

Full questionnaires designed to measure Part 1 measures (ongoing earthquake-related stressors, posttraumatic stress symptoms, relationship quality) and Part 2 measures (posttraumatic stress symptoms, relationship quality, received support, and negative exchanges) (note: formatting is not identical to online questionnaire lay out).

Ongoing Earthquake-Related Stressor Scale adapted from Kuijer et al. (2014; see also Marshall et al., 2014)

Earthquake-Related Hassles you're Currently Experiencing

Hassles are irritants that can range from minor annoyances to fairly major pressures, problems or difficulties. Listed below are a number of ways in which a person can feel hassled. First, indicate the hassles that you are CURRENTLY experiencing as a result of the earthquake. Then indicate how stressful they have been for you. If a hassle does not occur at present or does not apply to you please click NO and do not indicate how stressful it has been.

	Applicable to you?		If applicable, how stressful has it been for you?		
	Yes	No	Not stressful	Moderately stressful	Extremely stressful
Increased travel time (to work, supermarket, driving children to school etc)	❍	❍	❍	❍	❍
Health problems	❍	❍	❍	❍	❍
Financial pressures	❍	❍	❍	❍	❍
Difficulties at work	❍	❍	❍	❍	❍
Concerns about job security	❍	❍	❍	❍	❍
Concerns about the future	❍	❍	❍	❍	❍
Too much time on hand	❍	❍	❍	❍	❍
Feeling lonely	❍	❍	❍	❍	❍
Not having proper heating in the house	❍	❍	❍	❍	❍
Not being able to live in your own house	❍	❍	❍	❍	❍
Living in a damaged property	❍	❍	❍	❍	❍
Overloaded with family responsibilities	❍	❍	❍	❍	❍
Too many things to do	❍	❍	❍	❍	❍
Extra people staying in your house	❍	❍	❍	❍	❍
Having to use a port-a-loo or chemical toilet	❍	❍	❍	❍	❍

Filling in forms (e.g. eqc, insurance, builders)	❍	❍	❍	❍	❍
Difficulties with your children	❍	❍	❍	❍	❍
Difficulties with friends	❍	❍	❍	❍	❍
Not being able to get the information you need	❍	❍	❍	❍	❍
Aftershocks	❍	❍	❍	❍	❍
Dust and mud from liquefaction in and around the house	❍	❍	❍	❍	❍
Not being able to go to usual places (e.g. malls, restaurants, art center, gym, pool, beaches) as they are closed from earthquake	❍	❍	❍	❍	❍
Damage to roads/infrastructure	❍	❍	❍	❍	❍
Increase in chores (e.g. cleaning) due to the earthquake	❍	❍	❍	❍	❍
Fixing your house/property (e.g. dealing with builders etc)	❍	❍	❍	❍	❍
Changes in your suburb (e.g. neighbours moved)	❍	❍	❍	❍	❍
Media coverage on the earthquake	❍	❍	❍	❍	❍
Dangerous road behaviour	❍	❍	❍	❍	❍
Change to the water (boiling, chlorinated, lowered pressure, not available etc)	❍	❍	❍	❍	❍
Public transport changes/delays	❍	❍	❍	❍	❍
Changes to your child(ren)'s schooling	❍	❍	❍	❍	❍
Family member(s)'s stress	❍	❍	❍	❍	❍
Hassles in parenting in this time	❍	❍	❍	❍	❍
Concerns about safety (including personal safety and safety of others)	❍	❍	❍	❍	❍
Zoning	❍	❍	❍	❍	❍
Dealing with officials (eqc, insurance etc)	❍	❍	❍	❍	❍
Difficulties sleeping (getting to or staying asleep)	❍	❍	❍	❍	❍
Your child(ren) coping poorly with the earthquakes/aftershocks	❍	❍	❍	❍	❍

Have we missed any hassles? Please write them below.

	How stressful has it been for you?		
	Not stressful	Moderately stressful	Extremely stressful
Hassle: _____ _____	❍	❍	❍
Hassle: _____ _____	❍	❍	❍
Hassle: _____ _____	❍	❍	❍

Impact of Event Scale-Revised (IES-R; Weiss & Marmar, 1997)[6]

Earthquake-Related Distress

Below is a list of difficulties people sometimes have after stressful life events, such as the Christchurch earthquake. Please read each item, and then indicate how much you have experienced each difficulty DURING THE PAST 7 DAYS in relation to the earthquakes (you may have experienced all of these reactions at some point after the earthquakes, but for this questionnaire we only want to know whether you have experienced these difficulties during the past week).

	Not at all	A little bit	Moderately	Quite a bit	Extremely
Any reminders brought back feelings about it	❍	❍	❍	❍	❍
I had trouble staying asleep	❍	❍	❍	❍	❍
Other things kept making me think about it	❍	❍	❍	❍	❍
I felt irritable and angry	❍	❍	❍	❍	❍
I avoided letting myself get upset when I thought about it	❍	❍	❍	❍	❍
I thought about it when I didn't mean to	❍	❍	❍	❍	❍
I felt as if it hadn't happened or wasn't real	❍	❍	❍	❍	❍

[6] Permission for replication sought from first-author

I stayed away from reminders about it	❍	❍	❍	❍	❍
Pictures about it popped into my mind	❍	❍	❍	❍	❍
I was jumpy and easily startled	❍	❍	❍	❍	❍
I tried not to think about it	❍	❍	❍	❍	❍
I was aware that I still had a lot of feelings about it, but I didn't deal with them	❍	❍	❍	❍	❍
My feelings about it were kind of numb	❍	❍	❍	❍	❍
I found myself acting or feeling like I was back at that time	❍	❍	❍	❍	❍
I had trouble falling asleep	❍	❍	❍	❍	❍
I had waves of strong feelings about it	❍	❍	❍	❍	❍
I tried to remove it from my memory	❍	❍	❍	❍	❍
I had trouble concentrating	❍	❍	❍	❍	❍
Reminders of it caused me to have physical reactions, such as sweating, trouble breathing, nausea, or pounding heart	❍	❍	❍	❍	❍
I had dreams about it	❍	❍	❍	❍	❍
I felt watchful and on guard	❍	❍	❍	❍	❍
I tried not to talk about it	❍	❍	❍	❍	❍

Perceived Relationship Quality Components Inventory (PRQC; Fletcher et al., 2000)[7]

Your Current Romantic Relationship Please respond to the following items by selecting one of the following, based on how you feel in your current relationship with your partner.

	1= Not at all	2	3	4	5	6	7= Extremely
How satisfied are you with your relationship?	❍	❍	❍	❍	❍	❍	❍
How committed are you to your relationship?	❍	❍	❍	❍	❍	❍	❍
How close is your relationship?	❍	❍	❍	❍	❍	❍	❍
How much do you trust your partner?	❍	❍	❍	❍	❍	❍	❍
How passionate is your relationship?	❍	❍	❍	❍	❍	❍	❍
How much do your love your partner?	❍	❍	❍	❍	❍	❍	❍

[7] Permission for replication sought from first-author

Received Support Questionnaire adapted from Van Sonderen (Bridges, Sanderman & van Sonderen, 2002) and Krause (1995).

Social Support from your Partner in the Past Week The next questions are about the different types of support your partner might have given you in the past week. In the past week, how often did your partner… AND then indicate if you would have preferred your partner to do the behaviour more, less or about the same amount.

	How Often Did Your Partner....					Your Preference		
	Never	Rarely	Sometimes	Often	Almost Always	More	Less	Same
show that they loved and cared for you	❍	❍	❍	❍	❍	❍	❍	❍
give you practical help	❍	❍	❍	❍	❍	❍	❍	❍
listen to you when you wanted to talk about things that were on your mind	❍	❍	❍	❍	❍	❍	❍	❍
show that they appreciated you	❍	❍	❍	❍	❍	❍	❍	❍
take over some of your chores/ responsibilities in and around the house	❍	❍	❍	❍	❍	❍	❍	❍
keep you company	❍	❍	❍	❍	❍	❍	❍	❍
spend time with you	❍	❍	❍	❍	❍	❍	❍	❍

Negative Exchanges Questionnaire adapted from Van Sonderen (Bridges, Sanderman & van Sonderen, 2002) and Krause (1995).

Negative Interactions with your Partner in the Past Week How often in the past week did your partner...

	Never	Rarely	Sometimes	Often	Almost Always
Criticize you	❍	❍	❍	❍	❍
Get impatient with you	❍	❍	❍	❍	❍
Get angry or upset with you	❍	❍	❍	❍	❍
Seem to avoid being around you	❍	❍	❍	❍	❍
Make too many demands	❍	❍	❍	❍	❍
Blame you for things	❍	❍	❍	❍	❍

Appendix 4

Table 13 *Descriptives of Variables for the Loss of Material Resources and Trauma Exposure Items*

	Women	Men
	M/n (*SD*/%)	*M/n* (*SD*/%)
Loss of Material Resources	4.28 (1.53)	[a]
Earthquake related moves[b]		
None	80 (80.8)	[a]
Once	15 (15.2)	[a]
Twice	3 (3.0)	[a]
Three Times	1 (1.0)	[a]
House damage[b]	1.84 (0.72)	[a]
House only partly liveable[b]	6 (6.1)	[a]
Current house damage[b]		
None	4 (4.0)	[a]
Cosmetic only	55 (55.6)	[a]
Structural/more than cosmetic	39 (39.4)	[a]
Currently no sewerage[b]	3 (3.0)	[a]
No insurance[b]	3 (3.0)	[a]
Lost job (1 partner)[b]	8 (8.1)	[a]
Lost job (both partners)[b]	1 (1.0)	[a]
Lost income[b]	47 (47.5)	[a]
Rental Damage[b]	13 (13.1)	[a]
Traumatic Exposure	3.15 (1.41)	2.92 (1.54)
Fear for life (2010 EQ)[c]	46 (46.5)	38 (38.4)
Fear for life (2011 EQ)[c]	42 (42.4)	35 (35.4)
Personal injury[c]	13 (13.1)	7 (7.1)
Personally hospitalized[c]	1 (1.0)	0 (0.0)
Family member injured[c]	8 (8.1)	14 (14.1)
Family member hospitalized[c]	1 (1.0)	2 (2.0)
Loss from immediate circle[c]	5 (5.1)	3 (3.0)
Loss from outside immediate circle[c]	33 (33.3)	29 (29.3)
Fear for other's safety[c]	73 (73.7)	59 (59.6)
Witnessing injury[c]	10 (10.1)	15 (15.2)

Note: Mean (*SD*) or number of cases (*%*) are presented. $N = 77 - 99$

[a]Scores identical for women and men [b]Items that make up loss of material resources. See measures for further detail [c]Items that make up trauma exposure (number of children was also included as a proxy). See measures for further detail

Appendix 5

Table 14 *Correlations for Time 2 for Time-Varying Variables and Time 0 or Time 1 for Time-Fixed Variables for Men and Women*

Variable	1	2	3	4	5
1. Relationship Quality	—	-.07	.01	.23*	-.07
2. Posttraumatic Stress Symptoms	-.17	—	.47***	-.09	.30**
3. Ongoing EQ stressors	-.12	.51***	—	.29**	.15
4. Loss of Material Resources	.16	.13	.32**	—	-.03
5. Trauma Exposure	.00	.15	.21	.18	—

Note. Time-fixed variables = loss of material resources and trauma exposure. Correlations among the variables for men appear below the diagonal; those for women appear above the diagonal.
** $p < .01$. *** $p < .001$.

Table 15 *Correlations for Time 3 for Time-Varying Variables and Time 0 or Time 1 for Time-Fixed Variables for Men and Women*

Variable	1	2	3	4	6
1. Relationship Quality	—	-.35**	-.11	.14	.01
2. Posttraumatic Stress Symptoms	-.13	—	.50***	.28*	-.02
3. Ongoing EQ stressors	-.10	.53***	—	.35**	-.07
4. Loss of Material Resources	.16	.22	.34**	—	-.03
6. Trauma Exposure	-.02	.07	.13	.12	—

Note. Time-fixed variables = loss of material resources and trauma exposure. Correlations among the variables for men appear below the diagonal; those for women appear above the diagonal.
** $p < .01$. *** $p < .001$.

Table 16 *Correlations for Time 4 for Time-Varying Variables and Time 0 or Time 1 for Time-Fixed Variables for Men and Women*

Variable	1	2	3	4	6
1. Relationship Quality	—	-.33**	.16	.14	-.09
2. Posttraumatic Stress Symptoms	-.06	—	.48***	.18	.11
3. Ongoing EQ stressors	-.01	.63***	—	.35**	.10
4. Loss of Material Resources	-.02	.21	.30*	—	-.03
6. Trauma Exposure	-.10	.20	.25*	.18	—

Note. Time-fixed variables = loss of material resources and trauma exposure. Correlations among the variables for men appear below the diagonal; those for women appear above the diagonal.
** $p < .01$. *** $p < .001$.

Appendix 6

Table 17 *Correlations for Variables at Time 2 for Men and Women*

Variable	1	2	3	4
1. Relationship Quality	—	-.07	.60***	-.42***
2. Posttraumatic Stress Symptoms	-.17	—	-.11	.24*
3. Received Social Support	.53***	-.11	—	-.53***
4. Negative Exchanges	-.38***	.36**	-.38***	—

Note. Correlations among the variables for men appear below the diagonal; those for women appear above the diagonal.
** $p < .01$. *** $p < .001$.

Table 18 *Correlations for Variables at Time 3 for Men and Women*

Variable	1	2	3	4
1. Relationship Quality	—	-.35**	.46***	-.48***
2. Posttraumatic Stress Symptoms	-.13	—	-.09	.14
3. Received Social Support	.60***	-.10	—	-.50***
4. Negative Exchanges	-.39***	.29*	-.47***	—

Note. Correlations among the variables for men appear below the diagonal; those for women appear above the diagonal.
** $p < .01$. *** $p < .001$.

Table 19 *Correlations for Variables at Time 4 for Men and Women*

Variable	1	2	3	4
1. Relationship Quality	—	-.33**	.51***	-.41***
2. Posttraumatic Stress Symptoms	-.06	—	-.20	.18
3. Received Social Support	.51***	.04	—	-.57***
4. Negative Exchanges	-.40***	.29*	-.29*	—

Note. Correlations among the variables for men appear below the diagonal; those for women appear above the diagonal.
** $p < .01$. *** $p < .001$.